

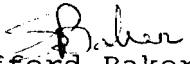
AGENCY FOR INTERNATIONAL DEVELOPMENT				1. TRANSACTION CODE <input checked="" type="checkbox"/> C A = Add C = Change D = Delete		Amendment Number 1		DOCUMENT CODE 3	
PROJECT DATA SHEET				3. PROJECT NUMBER 615-0229					
COUNTRY/ENTITY Kenya				5. PROJECT TITLE (maximum 40 characters) National Agricultural Research					
4. BUREAU/OFFICE AFR				06					
6. PROJECT ASSISTANCE COMPLETION DATE (PACD) MM DD YY 09 30 97				7. ESTIMATED DATE OF OBLIGATION (Under "B" below, enter 1, 2, 3, or 4) A. Initial FY 86 B. Quarter 4 C. Final FY 97					
8. COSTS (\$000 OR EQUIVALENT \$1 = )									
A. FUNDING SOURCE			FIRST FY 87			LIFE OF PROJECT			
			B. FX	C. L/C	D. Total	E. FX	F. L/C	G. Total	
AID Appropriated Total			3,700	1,990	5,690	22,000	8,000	30,000	
(Grant)			(3,700)	(1,990)	(5,690)	(22,000)	(8,000)	(30,000)	
(Loan)			( )	( )	( )	( )	( )	( )	
Other 1.									
U.S. 2.									
Host Country				3,910	3,910		11,809	11,809	
Other Donor(s)									
TOTALS			3,700	4,900	9,600	22,000	19,809	41,809	
9. SCHEDULE OF AID FUNDING (\$000)									
A. APPRO- PRIATION	B. PRIMARY PURPOSE	C. PRIMARY TECH. CODE		D. OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
	CODE	1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
(1) ARDN	111	080		8,726				8,726	
(2) DFA	111	080		6,524		2,000		21,274	
(3)									
(4)									
TOTALS				15,250		2,000		30,000	
10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each)								11. SECONDARY PURPOSE CODE	
968		700		054		072		121	
12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)									
A. Code		BSW							
B. Amount									
13. PROJECT PURPOSE (maximum 480 characters)									

To develop a well-managed national agricultural research system capable of providing the farm sector with appropriate technologies which will increase productivity on a continuing basis.

14. SCHEDULED EVALUATIONS				15. SOURCE/ORIGIN OF GOODS AND SERVICES			
Interim	MM YY	MM YY	Final	MM YY	MM YY	MM YY	MM YY
	0 6 9 5			0 6 9 7			
				<input checked="" type="checkbox"/> 000 <input checked="" type="checkbox"/> 941 <input type="checkbox"/> Local <input checked="" type="checkbox"/> Other (Specify) 935			
16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a 51 page PP Amendment.)							
To provide additional A.I.D. financing for the project totalling \$14,750,000 and to extend the PACD to September 30, 1997. Methods of Implementation and financing have been approved by the Mission Controller <i>[Signature]</i> .							

17. APPROVED BY	Signature Roger J. Simmons	18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCU- MENTS, DATE OF DISTRIBUTION
	Title Acting Director, USAID/Kenya Date Signed MM DD YY 06 12 19 97	

**ACTION MEMORANDUM FOR THE ACTING DIRECTOR, USAID/KENYA**

**FROM:**  Stafford Baker, Office of Projects  
**SUBJECT:** National Agricultural Research Project (615-0229)  
**DATE:** June 5, 1992

Action:

Your approval is requested for a grant in the amount of \$14,750,000 from the Development Fund for Africa to the Government of Kenya for the National Agricultural Research Project (615-0229) Phase II amendment. The amendment includes an extension of the Life of Project to September 30, 1997. It is planned that \$2,000,000 will be obligated in FY92.

Background and Description:

The National Agricultural Research Project was originally envisioned as a 10-year project whose purpose was: **To develop a well-managed national agricultural research system providing the agricultural sector with appropriate technologies which will increase productivity on a continuing basis.** The project was authorized for an initial seven year Phase I, with the following four components: (1) Research Planning and Management; (2) Maize and Sorghum/Millet Commodity programs; (3) Human Resource Development; and, (4) an Agricultural Research Fund. The project has been implemented under a four year host country contract between the Kenya Agricultural Research Institute (KARI) and the Midamerican International Agricultural Research Consortium (MIAC).

Considerable progress towards achievement of the project purpose has been accomplished, with a significant acceleration of this process during the past three years. However, the purpose of the project was not expected to be achieved in Phase I and this PP amendment for a five year Phase II to complete the project was planned from the outset. The single most important constraint to project purpose achievement has been the timely provision of operating funds for research. While recent progress has been made on this issue, it will remain a major component for improvement and monitoring under the second phase of USAID support to KARI.

A major concentration of Phase II activities will be the Research Planning and Management system being established within KARI. Program planning and resource allocation, financial management, human resource management, and monitoring and evaluation, are targeted for a significant level of effort and resources under the second phase. The shift in emphasis is on KARI's utilization of

planning and management information systems established under Phase I. Major challenges for KARI will include matching financial resources to scientific staff for achieving substantial increases in the effectiveness of the research system.

The Commodity Research focus will also shift under the second phase. High value horticultural commodities will become a major new initiative and the small ruminant program will be incorporated within the KARI system. While important objectives remain to be achieved for the cereals program, USAID support is reduced considerably after the initial two years of Phase II. It is planned that the maize and sorghum/millet programs will be well institutionalized within KARI by 1994.

Human Resources Development will be dropped as a separate component in Phase II. Instead, training requirements have been assessed for each major project element and budgeted as part of the relevant component development plan. The Agricultural Research Fund is continued with additional funding but otherwise without change in Phase II.

The End of Project Status (EOPS) indicators of success in accomplishing the project's purpose are as follows:

- (1) KARI having a well managed research system with budgets and resources allocated in accordance with national priorities and productivity of individual research units.
- (2) KARI producing a regular flow of new technology recommendations for maize, sorghum, millet, two to three key horticultural crops and small ruminant production.
- (3) KARI having an applied farming systems research system in place and functioning which assists with the establishment of research priorities through farmer interaction, tests new technologies under on-farm conditions and facilitates the dissemination of production packages through the extension system.
- (4) KARI having professional staff functioning effectively in research and administration.

#### Analyses and other requirements:

The Project Paper Amendment demonstrates that:

- o The project is technically, economically and socially sound, and administratively feasible;

- o The technical design and cost estimates are reasonable and adequately planned, thereby satisfying the requirements of Section 611(a) of the Foreign Assistance Act, as amended;
- o The timing and funding of project activities are appropriately scheduled and the implementation plan is realistic and establishes a reasonable time frame for carrying out the project;
- o Adequate provision has been made for evaluation and audit;

The original Initial Environmental Examination (IEE) for the project covered the complete 10 year program that is now Phases I and II. The IEE proposed a categorical exclusion for the Research Planning and Management and training components, and a deferred threshold decision for Commodity Research Programs and the Agricultural Research Fund. USAID/Kenya was advised by State 389802 dated December 24, 1985, that the IEE had been approved by the Bureau Environmental Officer and Legal Advisor.

A further report on Environmental Considerations was prepared for the original PP and provided recommendations on handling of pesticides, research methodologies and orientation, preferred pesticides for maize, sorghum and millets, and environmental review procedures for Research Fund proposals. All of these recommendations have been incorporated into the management procedures for the project and will be continued in Phase II.

#### OVERALL PROJECT BUDGET SUMMARY (\$000)

	Phase I		Phase II		Combined LOP		
	A.I.D.	GOK	A.I.D.	GOK	A.I.D.	GOK	Total
Technical Assistance	4,034	0	5,748	60	9,782	60	9,842
Training	4,322	320	3,727	650	8,049	970	9,019
Commodities	2,106	382	1,366	125	3,472	507	3,979
Operational Support	0	666	1,216	1,325	1,216	1,991	3,207
Construction	470	0	0	85	470	85	555
Research Fund	630	163	350	50	980	213	1,193
Local Personnel	0	4,855	0	2,840	0	7,695	7,695
Evaluation/Audit	85	50	250	40	335	90	425
Administration	3,553	28	2,093	170	5,646	198	5,844
Contingency	50	0	0	0	50	0	50
Totals	15,250	13,940	14,750	5,345	30,000	11,809	41,809

## Conditions and Covenants:

The following proposed Conditions Precedent and Covenants have been developed by USAID/Kenya in consultation with KARI and MIAC. They address key concerns over the budgetary implications of direct A.I.D. support for KARI operational expenses and the plan in Phase II to more closely tie training to specific KARI program requirements.

### 1. Conditions Precedent

The amendment to the Project Grant Agreement shall contain conditions precedent to disbursement of funds authorized providing in substance as follows:

- a. Prior to disbursement of funds in support of recurrent costs which shall have been incurred during the periods from July 1 to December 31 and from January 1 to June 30 in any calendar year, KARI first will have provided to USAID, and USAID will have approved in writing, detailed program/work plans which will include program budgets for each such period. The plans will be submitted to USAID on or before May 31 and November 30 of each year, to allow time for USAID review and written response.
- b. Prior to disbursement of any funds for expenses related to any training program commencing after July 1, 1992, KARI first will have provided to USAID, and USAID will have approved in writing, an organizational manpower development plan that reflects existing levels of trained staff and future organizational needs for the period remaining in the project.

### 2. Covenants

The amendment shall contain covenants providing in substance as follows:

- a. KARI will provide to USAID on an annual basis budgetary information which will demonstrate an incremental but steady movement toward a 60/40 ratio of personnel to operational costs by the end of the project.
- b. KARI will demonstrate through a continuing review of existing research facilities and personnel the rationalization of a research system consistent with all available resources. Special attention should be directed to the reduction of staff and redeployment of staff to other potentially productive and revenue generating activities, and an examination of required research and production facilities. USAID should be advised on an annual basis of the status of such review and specific actions taken.

- c. KARI will within six months from the beginning of the Phase II activities submit to USAID a plan which will closely coordinate research management activities undertaken by both project technical assistance staff and ISNAR staff. Such a plan should be developed in consultation with ISNAR and project staff, be incorporated within annual plans of work and be formalized within a memorandum of understanding.
- d. KARI will within six months of the start of Phase II activities have an adequately staffed and functioning socio-economics unit with responsibility for research policy guidance and monitoring and evaluation functions.

Waivers:

On March 8, 1991, AID/W approved a waiver to allow MIAC to assist with the design and implement Phase II of the project under an extension of the existing Host Country Contract between KARI and MIAC.

Project Review Committee Action:

The Project Review Committee reviewed the Project Paper Amendment on March 11, 1992 and recommended approval subject to modifications to the budget, to fit project costs to the limited availability of OYB resources for the project in FYs 92, 93 and 94, and the inclusion of a Financial Analysis to explain the justification and cost estimates for Operational Support to KARI. These modifications have now been incorporated in the Project Paper Amendment.

Notification to Congress:

A Congressional Notification for the project amendment resulted in an informal hold which has now been resolved.

Authority:

Delegation of Authority 551 Section 4 provides you with the authority to amend a project if the amendment: does not exceed \$30 million life of project funding; does not present significant policy issues; does not require waivers which can only be granted by the Assistant Administrator for Africa or the Administrator; and does not have a project life in excess of 10 years. Except for the proposed Life of Project, the Authorization of the project amendment is within your delegated authority. The Acting Assistant Administrator for Africa, in 92 State 176754, has provided you with an ad hoc delegation authorizing you to extend the Life of Project up to twelve years. The proposed Life of Project is eleven years and one month.

Recommendation:

That you sign the attached project authorization amendment and Project Paper facesheet, and thereby approve life of project funding of \$30,000,000 in grant funds and a Life of Project to September 30, 1997, for the National Agricultural Research Project (615-0229).

Approved: *Carol J. Simmons*

Disapproved: \_\_\_\_\_

Date: *6/25/92*

drafted by: PRJ,SBaker

cleared by: D/DIR,RSimmons *CS*  
                  PROG,CSteele *CS*  
                  CONT,TTotino *CS*  
                  RLA,CBrown *CS*  
                  AGR,JGingerich *CS*

PROJECT AUTHORIZATION AMENDMENT NO. 1

Country: Kenya

Project: National Agricultural Research

Project Number: 615-0229

1. Background: Pursuant to Section 103 of the Foreign Assistance Act of 1961, as amended, the National Agricultural Research Project was authorized on August 21, 1986 with a Life-of-Project ("LOP") funding of not to exceed Fifteen Million Two Hundred and Fifty Thousand (\$15,250,000) United States dollars in planned obligations over a four year period from the date of authorization. The planned life of project was seven years from the date of initial obligation.

2. Additional Funding: The authorization cited above is hereby amended as follows:

Pursuant to Section 496 of the Foreign Assistance Act of 1961, as amended, I hereby authorize an additional Fourteen Million Seven Hundred and Fifty Thousand (\$14,750,000) United States dollars for said Project for a new authorized LOP funding of Thirty Million (\$30,000,000) United States dollars. This involves planned obligations of grant funds subject to the availability of funds in accordance with the A.I.D. OYB/Allotment process, to help in financing foreign exchange and local currency costs for the Project. The planned life of project is until September 30, 1997.

3. Source and Origin of Commodities, Nationality of Services:

With respect to the additional funds authorized and planned for obligation under paragraph 2 above, except as A.I.D. may otherwise agree in writing:

(a) Commodities financed by A.I.D. under the Project shall have their source and origin in countries included in A.I.D. Geographic Code 935.

(b) Except for ocean shipping, the suppliers of commodities or services financed by A.I.D. under the Project shall have countries included in A.I.D. Geographic Code 935 as their place of nationality.

(c) Ocean shipping financed by A.I.D. under the Project shall be financed only on flag vessels of the countries included in A.I.D. Geographic Code 935 and shall also be subject to the 50/50 shipping requirements under the Cargo Preference Act and the regulations promulgated thereunder.



(d) Air travel and transportation to and from the United States shall be upon certified U.S. flag carriers to the extent such carriers are available within the terms of the U.S. "Fly America" Act.

(e) All reasonable efforts will be used to maximize U.S. procurement whenever practicable.

4. Conditions Precedent:

The amendment to the Project Grant Agreement shall contain conditions precedent to disbursement of funds authorized providing in substance as follows:

- a. Prior to disbursement of funds in support of recurrent costs which shall have been incurred during the periods from July 1 to December 31 and from January 1 to June 30 in any calendar year, KARI first will have provided to USAID, and USAID will have approved in writing, detailed program/work plans which will include program budgets for each such period. The plans will be submitted to USAID on or before May 31 and November 30 of each year, to allow time for USAID review and written response.
- b. Prior to disbursement of any funds for expenses related to any training program commencing after July 1, 1992, KARI first will have provided to USAID, and USAID will have approved in writing, an organizational manpower development plan that reflects existing levels of trained staff and future organizational needs for the period remaining in the project.

5. Covenants:

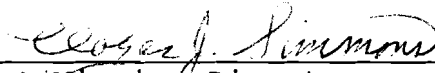
The amendment shall contain covenants providing in substance as follows:

- a. KARI will provide to USAID on an annual basis budgetary information which will demonstrate an incremental but steady movement toward a 60/40 ratio of personnel to operational costs by the end of the project.
- b. KARI will demonstrate through a continuing review of existing research facilities and personnel the rationalization of a research system consistent with all available resources. Special attention should be directed to the reduction of staff and redeployment of staff to other potentially productive and revenue generating activities, and an examination of required research and production facilities. USAID should be advised on an annual basis of the status of such review and specific actions taken.


- c. KARI will within six months from the beginning of Phase II activities submit to USAID a plan which will closely coordinate research management activities undertaken by both project technical assistance staff and ISNAR staff. Such a plan should be developed in consultation with ISNAR and project staff, be incorporated within annual plans of work and be formalized within a memorandum of understanding.
- d. KARI will within six months of the start of Phase II activities have an adequately staffed and functioning socio-economics unit with responsibility for research policy guidance and monitoring and evaluation functions.

6. Other Terms and Conditions:

Except as above amended, all other terms and conditions of the original Authorization shall remain in full force and effect.

  
Acting Mission Director

6/25/92  
Date

CLEARANCES: RLA, CBrown   
CONT, TTotino (draft)  
PROG, CSteele (draft)  
AGR, JGingerich (draft)

DRAFTED:   
PRJ, SBaker

**National Agricultural Research Project (615-0229)**

**Project Paper Amendment for Phase II**

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## ANNEXES

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Annex B:	Economic Analysis Update
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## I. Introduction

Kenya relies heavily on the agricultural sector for the generation of income, employment, foreign exchange earnings and the provision of raw materials for the industrial sector. A key component to Kenya's development policy has been that agriculture must grow rapidly enough not only to feed a burgeoning population but also to provide surplus resources for investment in industry and infrastructure for sustainable broad-based economic growth.

Given major constraints posed by rapid population increases and the availability of arable land, accelerated agricultural growth will necessarily be generated from productivity increases on a relatively fixed land base. To achieve this requires the adequate development of agricultural incentives, services and institutions needed to encourage innovation and investment. Investment is a function of relative returns to agriculture and other incentives created by an enhanced economic and investment environment within Kenya. Innovation will occur through an improved agricultural research enterprise which is more directly linked to markets, consumers, farmers and the agro-industrial sector of Kenya.

Kenya has a long tradition of agricultural research going back several decades. A recent study of maize research in Kenya for the period 1959-89 indicates the marginal rate of return for research in maize averaged 40 percent during this period. Significant, past success stories are equally impressive for tea, coffee and livestock/dairy. Kenya's agriculture research system also produced the French bean variety primarily produced by smallholders which has become Kenya's foremost vegetable export, growing in value of exports per annum by an average of 18 percent over the last five years.

Notwithstanding these past research achievements, the rate of growth in the agriculture sector has been declining since the late 1970's. While foodgrain productivity growth increased by approximately 2.0 percent per annum during the 1980's, per capita food production has declined. This period corresponds to an era in Kenya's agricultural research system which was characterized by fragmentation and a lack of focus, often contributed to by inconsistent, widely dispersed donor-funded projects. Following a series of studies undertaken by the GOK in association with the International Service for National Agriculture Research (ISNAR), a comprehensive plan for the consolidation of research activities under a completely restructured Kenya Agriculture Research Institute (KARI) was launched in 1987. Twelve donors committed resources to a coordinated program of support to KARI.

The design of USAID/Kenya's support to this effort was premised on the realization of the need for a consistent, longer term support program to build a sustainable agricultural research system in Kenya which was more client-oriented. Thus, the National

Agricultural Research Project (NARP), developed in collaboration with KARI, was designed for a ten-year period. However, due to USAID budgetary constraints a funding commitment for an initial four-year phase was authorized. This first phase was extended by one year to June, 1992. This project amendment proposes adjustments in components to the project and extends the program for five years to correspond to the originally envisioned ten year life of project.

#### A. Status of Phase I Project

The purpose of the USAID-funded NAR Project is to develop a well-managed national agricultural research system providing the agricultural sector with appropriate technologies to increase productivity on a continuing basis. To achieve this objective the project has focused on four components: (1) Research Planning and Management; (2) Maize and Sorghum/Millet Commodity programs; (3) Human Resource Development; and, (4) the Research Fund.

Clearly the purpose of the project, established for the 10-year timeframe, is yet to be achieved. Progress on project components critical to achievement of the program purpose has been accomplished with a significant acceleration of this process during the past three years.

Under the Research Planning and Management component, financial, administrative and management information systems have been established within KARI. Several of these systems are being fully implemented by KARI staff. Two key areas which require considerable, continuing efforts will include the decentralization of the financial management/accounting systems to major research centers and the systematic utilization of these data bases for research planning and program budgeting.

For the Commodity Research Component, KARI has significantly strengthened its capacity for program formulation and priority-setting in major commodity areas including maize and sorghum/millet. The maize commodity research activities represent the best developed program in KARI. The release of new seed varieties and success in addressing a maize streak virus outbreak have been major accomplishments. The sorghum/millet program was slower in being established but now has a comprehensive development plan with budget requirements for the next five years.

The Human Resource Development component has focused on establishing a long-term training plan within KARI matching KARI's projected requirements for upgrading scientific and support staff skills with resource levels. Thirty-one MSc and seventeen PhD participants were placed in U.S. universities during Phase I with twenty-eight participants having returned to KARI positions.

Finally, after some delay the Research Fund has been established and the first five grants to private and university recipients have been issued. Some private donations have been obtained by KARI for the Research Fund.

In summary, following a very uncertain beginning for KARI, major progress on all project components has been achieved in the past 30 months. Structures and mechanisms have been established on which the Phase II program can be built. However, there remains major requirements for improving the quality and cost effectiveness of research for the generation of technology, particularly for smallholders. The single most important constraint has been the timely provision of operating funds for research. While recent progress has been made on this issue, it will remain a major component for improvement and monitoring under the second phase of USAID support to KARI.

#### B. NARP PHASE II

The basic rationale incorporated in the initial design of the project, namely the need for an effective and productive agricultural research system as a key element for increasing agricultural productivity in Kenya, remains valid. Phase II will focus on consolidating structures and mechanisms which are critical for establishing a research system which efficiently develops and disseminates a stream of technologies for increasing agricultural productivity.

A major concentration of Phase II activities will focus on the research planning and management system being established within KARI. Specific activities, namely program planning and resource allocation; financial management; human resource management; and monitoring and evaluation, are targeted for a significant level of effort and resources under the second phase. The shift in emphasis is on KARI's utilization of planning and management information systems established under Phase I. Major challenges for KARI will include matching financial resources to scientific staff for achieving substantial increases in the effectiveness of the research system.

The commodity research focus will shift under the second phase. High value horticultural commodities will become a major focus and the small ruminant program will be incorporated within the KARI system. While important objectives remain to be achieved for the cereals program, USAID support phases down considerably after the initial two years. It is realistically projected that the maize and sorghum/millet programs will be well institutionalized within KARI by 1994.

Achievement of the purpose of this project would establish a model research system in Africa. A key indicator for achieving that

level of success would include a major change in USAID's program assistance management mode. If projected improvements in the planning and financial management structures of KARI are accomplished, USAID should seriously consider a future assistance mechanism for KARI, where annual obligations are based on annual workplans and M&E reports, "scientific" exchanges replace traditional technical assistance approaches and USAID's investments in agricultural research are based on the same measures KARI has analyzed and prepared for the Treasury or private sources of finance. With constrained budgets a universal phenomenon future investments in KARI by the GOK and donors will be influenced by monitoring results of the returns to investments in research undertaken by KARI.

## II. Phase II Design Factors

### A. Relation to USAID/Kenya Strategy

The objectives of the project are consistent with and directly related to the overall goal of sustained and broad-based economic growth as stated in USAID's Country Program Strategic Plan for 1991-95. The program is directly supportive of USAID's key objectives for the agricultural sector -- increasing production, employment, income and foreign exchange -- and with the GOK's strategy for the sector as outlined in the Sixth Development Plan (1989-1993).

USAID's strategy emphasizes actions required to address major constraints to significant growth to productivity and farm incomes. A major target of this strategy is to accelerate technology development and transfer to small- and medium-scale farmers in assisting them to overcome technical constraints to higher production levels. The project, with its emphasis on assisting the development of a national research enterprise which is more responsive to farm and agro-enterprise clients, will directly address these constraints.

The project strongly complements other Mission programs focused on increasing agricultural marketing efficiency and promoting agribusiness development. The Kenya Market Development Program (KMDP) is supporting the GOK's program for cereal sector reform by expanding the role of private sector participation in all aspects of marketing and processing functions. The Fertilizer Marketing Reform Program has supported major changes in the fertilizer import and distribution structure which has positioned the fertilizer trade group, the Kenya National Fertilizer Association (KNFA), to more efficiently respond to fertilizer demand in Kenya. Finally, USAID's support to agribusiness development will continue to influence producer and firm-level demand for innovations and new technologies to which KARI is responding in an increasingly capable



manner. The marketing and agribusiness efforts are addressing constraints to the agricultural investment environment. Increases in farmer income derived from improved performance of commodity and input marketing arrangements will facilitate the adoption of yield-increasing technologies. Thus, the project is a central component of USAID's strategy for supporting the development and dissemination of cost-effective, appropriate technologies to producers and agroenterprises in Kenya. The project is directly supportive of the broader USAID and GOK objectives of accelerating agricultural growth in Kenya.

#### B. Lessons from Phase I

The development of the Kenya Agricultural Research Institute (KARI) within the GOK's National Agricultural Research Plan established in 1985 was designed to restructure and rationalize a national agriculture research system capable of focusing resources on priority research topics and to produce early results from GOK and donor investments within the research system. The Plan and Phase I of the project were extremely ambitious, seeking to move forward on all development fronts at the same time. Two critical assumptions in the Phase I project were: (1) a stable and supportive external environment; and (2) timely and predictable funding flows from the GOK and donors. During the first three years of Phase I implementation, progress in the development of KARI was severely impeded by major problems in both assumptions. Expectations as to the pace of KARI's development were unrealistic and the recent severe downturn in Kenya's economic performance has directly affected the investment environment in agriculture. The uncertainties of KARI's home ministry during this period was also deeply disruptive to the research system and severely delayed the establishment of the research program as outlined in the original project design.

Since mid-1989, following the appointment of new executive management within KARI, significant progress has been achieved, particularly in the formulation of national commodity and factor research programs and the establishment at several research centers of a much improved base for applying a Farming Systems Approach to adaptive on-farm research programs. Progress to date with the maize and sorghum/millet research programs provide a reasonable basis for the planned phasing down of USAID support beginning in 1994.

Progress on several key objectives has not been sufficient to achieve significant impact on the Project's purpose. The requirement to focus scientific and financial resources on priority research activities remains a major area for improvement. Reductions in overall staffing levels combined with changed ratios of scientific and support staff mixes is required to improve KARI's ability to focus on priority research areas.

The most binding constraint to achieving the purpose of the project has been inadequate funding levels and poor financial management capability within KARI. Late and/or inadequate provision of operational funds have delayed critical research activities and have seriously reduced the effectiveness of project and KARI financed staff. In a major departure from Phase I of the project, USAID will provide Operational Support funds in Phase II to ensure that critical research activities are undertaken at the appropriate time.

Following the recent joint donor review of the National Agriculture Research Plan, agreements were reached with Treasury on improving the stability and timeliness of the release of funds to KARI. These agreements will provide a stronger basis for planning allocations for research operations. Specific components of these agreements with Treasury and evidence of their implementation include:

- o The single line-item budget for operational research which provides KARI the authority and responsibility to ensure that resource allocations at all levels are consistent with national and/or regional priority objectives.
- o A significant increase in personal emoluments funding which meets KARI's requirements and has facilitated substantial reduction of KARI's debt.
- o Access to IBRD/IDA funding for operational research which will strengthen the resource base for on-farm adaptive research.

These developments, incorporated in the financial analysis section of this amendment, represent considerable efforts on the part of KARI and donors over the past two years and provide a strengthened justification for providing temporary operational support to KARI.

Improving the stability of research funding in combination with KARI's enhanced capability for financial management, including the decentralization of authority and responsibility to major research centers for these activities, will continue to occupy a central focus for the research planning and management component of the Phase II project. The productivity of the research system and achievement of the project purpose will substantially depend on a highly developed research planning and management structure within KARI.

### III. Phase II Description

#### A. Phase II Project Goal and Purpose

The goal for phase II remains the same as the original goal of the project: **To increase Kenya's national food security through increased agricultural productivity especially in the smallholder sector.** A point of clarification may be in order, however, regarding this goal. The concept of food security is used in the broader sense of households being able to secure adequate supplies of food either through their own production, income producing activities or a combination of the two. Thus, food security is in contrast with the concept of food self-sufficiency where all food is expected to be produced locally and encourages the production of those goods for which an area has a comparative advantage. It is assumed that if commodities are produced for export with the result that internal food production is insufficient to meet the demand for food, then a portion of the foreign exchange earnings will be used to import the required food. It is implicit in this goal statement that Kenyans will have adequate supplies of food while maximizing the productivity of their resources. Progress towards achievement of the project's goal will be measured by (1) annual increases in agricultural value added, (2) increases in food crop yields, and (3) annual increases in on-farm profits.

The purpose for phase II remains the same as the original purpose of the project: **To develop a well-managed national agricultural research system providing the agricultural sector with appropriate technologies which will increase productivity on a continuing basis.** The End of Project Status (EOPS) indicators of success in accomplishing the project's purpose are as follows:

- (1) KARI having a well managed research system with budgets and resources allocated in accordance with national priorities and productivity of individual research units.
- (2) KARI producing a regular flow of new technology recommendations for maize, sorghum, millet, two to three key horticultural crops and small ruminant production.
- (3) KARI having an applied farming systems research system in place and functioning which assists with the establishment of research priorities through farmer interaction, tests new technologies under on-farm conditions and facilitates the dissemination of production packages through the extension system.
- (4) KARI having professional staff functioning effectively in research and administration.

## B. Phase II Project Components

Phase I of the project concentrated on four major components: (1) assistance to planning and management; (2) commodity research program support with particular emphasis on maize, sorghum and millet; (3) human resource development; and, (4) agricultural research fund. The second phase will have similar components but with somewhat different emphases. The three areas in which the assistance of Phase II concentrates are: (1) Research Planning and Management, (2) Commodity Research Programs and (3) Agricultural Research Fund. In addition to the major components, there are inputs and costs related to Administration under both Phases I and II of the project.

A comparison of the Phase I and II components will identify three areas of change. First, the important work in management continues but sufficient progress has been made to allow two separate activities to be consolidated into an area emphasizing the refinement and institutionalization of these important systems. Second, staffing and strengthening of the two major commodity research areas (maize and sorghum/millet) have progressed sufficiently to allow assistance to be channeled into two other high priority commodity areas. Third, human resources development is eliminated as a separate component and becomes a critical input into the other components.

Inadequate human resource continues to be a crucial constraint to sustained research productivity. Although some headway has been made over the past four years in closing the gap between what is needed and what exists, there are wide variations in the numbers of qualified scientists across different programs. For example, the maize program is close to having an adequate human resource base to enable it achieve its objectives. However, trained personnel for the horticulture program are inadequate and any research efforts in this area will have to address the issue of human resources early on if a sustainable program is to be built. With regard to long-term training a corollary objective is to realize 20:60:20 ratio, for PhD: M.Sc: B.Sc: respectively to support the diverse agricultural base in the country.

Participant training will take place in both the US and Kenya. It is expected that as appropriate, thesis/dissertation research, particularly at the Ph.D. level, will be done in Kenya depending on the discipline. Under Phase I it is estimated that 13 of the 17 Ph.D. candidates will do their research in Kenya. It is believed that this is a productive strategy although it adds to the cost and time of the programs.

Short-term training programs will be significantly increased under this amendment. In planning and management, emphasis will be on internships of three months each in areas such as personnel management, policy analysis and assessing of research impacts,

human resource development and management information systems. These will be coupled with in-country workshops, management study tours, visiting scientists and executive short courses. This training is expected to expose KARI management and scientists to information and data necessary in decision making.

A more detailed description of the three major components under Phase II of the project follows:

1. Research Planning and Management

- a. Management Information Systems

In Phase I notable gains have been made in establishing within KARI administrative support systems for financial management, data processing, and management information, and training KARI personnel in the use and maintenance of those systems. Specifically KARI now has automated systems to handle payroll/personnel, fixed asset management and accounting. Progress has also been made on establishing a system to determine research priorities and allocate resources. Both of the project's mid-term reviews spoke to the progress that had been made in these areas although the Joint Donor Review observed that much more needed to be done to move KARI in the direction of program budgeting.

Phase II support will be targeted towards institutionalizing the new systems and helping managers understand their capability as decision making tools. Continued assistance is crucial at this stage if the KARI administrative team is to make the transition from being simply administrators of a large complex bureaucracy to being managers and leaders of a research organization.

In summary, the major emphasis for this sub-component in Phase II will be to enhance the efficiency of the administrative support systems developed in Phase I making them truly Management Information Systems. Complementing this will be a parallel effort to implement a planning and program budgeting process based on prioritization of projects/programs and allocation of resources consistent with these plans. A major effort will be made to develop systems which will allow research managers to effectively monitor and evaluate the progress of projects and the contribution individual scientists are making to those projects. A companion effort will assist KARI in developing the capability to assess the impacts of its research which in turn will feed back into an on-going priority setting process.

### b. Transfer of Technology

During Phase I the transfer of technology was not a specific component in the project. However, short-term consultants were provided in the areas of strengthening research and extension linkages, and strengthening KARI's publications program. With the creation of KARI, the research and extension organizations were separated in terms of their home Ministries, with extension actually taking place in both the Ministry of Agriculture and Ministry of Livestock Development. There has been a deterioration in linkages between research and extension caused in part by this separation into separate ministries and in part by the lack of funds, primarily for travel, available to KARI to work with extension staff. Recently formed national, regional and district farming systems linkage bodies and the appointment of Liaison Officers in KARI, MOLD, and MOA should improve communications and the ability of KARI to work with extension.

The major emphasis of this sub-component is to assist KARI to improve its communications/information dissemination capability thereby institutionalizing an approach to disseminating information to farmers on adapted agricultural technologies through traditional and non-traditional channels.

#### Output

The output for this component remains the same as for Phase I: **A strengthened agricultural research planning, administration, management and communication system.** Indicators of output achievement for Phase II are:

- (1) A standard personnel management system in place;
- (2) Monitoring and Evaluation systems in place for five major commodity research programs;
- (3) Budgets allocated according to a research prioritization plan;
- (4) Impact assessments completed for the research done on three major problem areas;
- (5) Increased capacity within KARI to present research results in training sessions, publications and through mass media in a form which is readily understandable and directly useful to frontline extension staff and farmers.
- (6) Improved linkages and interactions via a systematic publications/communications capability with governmental and non-governmental organizations (including NGOs) with capabilities to disseminate information to farmers.

- (7) The establishment of a research - extension coordinating committee with regularly held meetings at least once every three months.

Inputs (see Annex J for details)

Technical Assistance	\$2,210,600
Long Term Advisor (48pm)*	
Short Term Consultants (17pm)	
Support for Administrative Systems (25pm)	
Training (1 PhD, 2 MS)	\$694,900
Commodities	\$85,000
Total	\$2,990,500

- \* An additional 12pm in the first year of Phase II is financed by carryover funds from Phase I.

The research management advisor will be assigned full time for the life of the project. During this period the research management advisor will also serve as Chief of Party. The COP will be assisted by a locally hired administrative assistant. The primary responsibility of the research management advisor will be to assist KARI and other senior government officers with the understanding and implementation of the management information systems being used by KARI. In the role of COP, the individual will be expected to give particular, personal attention to the identification and utilization of short term technical assistance under this component.

Short-term technical assistance totalling two years in the area of monitoring and evaluation and assessing project impacts will be provided. A major accomplishment of this input will be to assist KARI in the development of appropriate units to manage this process over the longer term. During Phase II the project will also train KARI staff who will then be positioned to assume full responsibility for these activities. In addition, support will be provided to maintain (and enhance as resources permit) the administrative support systems (accounting, payroll, personnel, fixed assets) developed during Phase I, with the goal of decentralizing financial data entry from Headquarters to RRC's and NRC's.

Short-term technical assistance (3pm), long- (2 MSc) and short-term training, and operational support will be provided for the publications program. Specific project activities will focus on increasing the capability of KARI to prepare and present popular (e.g., short "how to" materials) and professional information such as brochures, materials in journals, material for mass media,

particularly radio and TV, the use of desk top publishing systems and the use of non-traditional dissemination methods.

Long-term training at the Masters level will be provided in writing/editing, communications and information dissemination. Operational funding will be provided for publication production and possibly for mass media involvement. This funding may include establishment of in-house publishing capability at the proper time.

## 2. Commodity Research Programs

### a. Maize

Significant progress was made during Phase I relative to the objectives of increasing total production of maize and improving the management of this commodity program. Yield increases came largely from the expanded area of maize production that followed the natural migration of the population to dryer regions. Between 1975 and 1989 the average yields increased by 19% while area planted increased by 44%. Over 65% of the area is currently planted to improved varieties. New varieties were released by the Kitale and Katumani Centers, but the frequency of release has decreased. Data suggest that the annual rate of yield increase is decreasing and large land holders are adopting technology faster than small holders.

The maize program benefitted during Phase I by having a group of scientists receive advanced degrees. During the absence of these key scientists the long-term technical assistants worked closely with those scientists remaining in order to sustain the productivity of programs. Significant purchases of needed equipment also occurred. By the end of Phase I several students are expected to return from their degree training programs. There will be a need for continued long-term assistance to nurture, interact with and provide counsel to the newly trained people.

During Phase II, the maize component will remain focused on increasing the stability of yields, closing the gap between on-farm and on-station yields of maize and improving the management of the commodity program to provide more efficient and effective research. The component objectives are fourfold: (1) To nurture and develop a stronger science base, (2) To enhance scientific leadership, motivation, and quality of effort, (3) to develop a sound long-range plan for maize agriculture in Kenya, and, (4) To increase emphasis on introduction of new varieties, agronomy, soil management and pest management aspects of maize production which respond to small producer conditions.



## Outputs

The output for this sub-component remains as stated in Phase I: **Improved farmer usable technologies developed for maize.** Efforts will continue to focus on maize varieties and cultural practices for Kenya's diverse agro-climatological conditions. The commodity research will be integrated with regional, on-farm research efforts taking into consideration the production issues of the small land holders. Indicators of output achievement for Phase II are:

- (1) Implementation of a short-term and a long-term plan for maize research.
- (2) Annual preparation and release of current recommendations on maize cultural practices to maximize economic returns for at least four ecological zones.
- (3) Three new, superior varieties of maize developed for two agro-ecological zones. (Superior varieties are defined as those having increased yield, improved resistance to pests and/or greater on-farm productivity).
- (4) A functioning system of linkages between researchers and the extension system and, through on-farm trials, to provide feedback from the farm level to research scientists.

## Inputs (see Annex J for details)

Technical assistance	\$1,459,000
Maize breeder (24pm)	
Systems Agronomist (Maize) (48pm)	
Short-term TA (12 pm)	
Training (2 PhD, 5 MS)	\$977,400
Operational Funds	\$435,000
Commodities	\$350,000
Total	\$3,221,400

A limited amount of commodities will be provided to support this component. Specialized field equipment for research trials, four field vehicles for both advisors and KARI research staff and furniture for the U.S. technical assistants are included in the commodity budget of \$350,000.

### b. Sorghum and Millet

The sorghum/millet program had less emphasis and was begun later in Phase I than was the maize program. This program has not had the

long emphasis or national priority that has been given to maize, but in a very complementary way contributes substantially to the food/feed needs of Kenya. The importance of sorghum and millet is expected to increase because they are better adapted to a wider range of climates than maize.

In order to improve yields and improve the management of the sorghum/millet program, several aspects were covered in Phase I. The national performance trials program for sorghum was revitalized and a national performance trials program for millet was initiated. Several Kenyan scientists were identified for advanced degrees who will serve in vital roles and provide the foundation for the enhanced sorghum/millet program of Phase II when they return from training.

The emphasis during Phase II will be three-fold: (1) to increase yield and stability of yield of sorghum and millet, (2) to develop a strong national program based on a cadre of well-trained scientists, and (3) develop processing and marketing technologies. Initial emphasis will be on developing a basic understanding of the available germplasm in both sorghum and millet, and evaluating the potential of hybrids in sorghum. Based on other work, it is expected that open-pollinated populations can be improved beyond current materials, but that sorghum hybrids will be superior and offer less risk in more harsh environments. Agronomic, soil management, pest management and socio-economic research will need to parallel the genetic evaluation efforts to develop meaningful technology for farmer use.

Major considerations or constraints will need to be addressed. First, since sorghum and millet are often grown in less favorable environments, there is a higher risk. Thus, cropping strategies need to be "defensive" against failure as well as low input. The second factor is that maize has a favorable history and is a preferred cereal. This will necessitate some parallel studies in processing and marketing sorghum and millet. In addition to food use, it is expected that sorghum and millet will also be used in beverages and feed. For that reason, some additional scientist time will be necessary to evaluate processing and marketing of these cereals, and to provide socio-economic evaluations and cooperation during on-farm trials.

### Output

The output for this sub-component remain as stated in the Phase I: **Improved farmer usable technologies developed for sorghum and millet.** Special focus of the sorghum/millet research will be on the smallholder, emphasizing varietal and cultural information consistent with the socio-economic status of the farmer. Specific programs will need to be developed for agro-ecological zones due to the geographic diversity of Kenya and where these crops are

comparatively adapted. Indicators of output achievement for Phase II are:

- (1) Annual preparation and release of current recommendations on sorghum/millet cultural practices to maximize economic returns for two major agro-ecological zones.
- (2) The development/testing of six to eight improved sorghum and millet varieties by the fourth year of Phase II.
- (3) The negotiation and agreement of a clear definition of responsibilities between the Kenya Seed Company, the Gene Bank and KARI relative to variety performance evaluation, release and seed production.
- (4) A system of on-farm research in place, resulting in four (4) on-farm research programs in each of the major sorghum producing areas in Kenya.

Inputs (see Annex J for details)

Technical Assistance	\$661,600
Sorghum/millet breeder (24pm)	
Short-term consultants (13pm)	
Training (3 PhD, 3 MS)	\$706,200
Operational funds	\$200,000
Commodities	\$280,000
Total	\$1,847,800

The commodities procured to support this component will be utilized primarily by the contract technical assistance staff and will consist of three new vehicles, household furnishings and a limited amount of specialized research equipment.

c. Horticulture

The rationale to develop a component to address the horticultural needs of KARI is consistent with the GOK's priority to expand the export of these commodities to meet the increasing demand for foreign exchange and allow for the employment of a significant labor pool at relatively high rates of return compared to other crops. In addition, horticultural crops are relatively high value and thus suitable to an economy faced with a shortage of arable land. These crops are also suitable for production by small scale farmers in a wide range of agro-ecological zones in Kenya. Lastly, the production of horticultural crops plays an important role in providing household food security, healthful and nutritious food and raising rural income.

In recent years, the production of horticultural commodities for export and in-country use has grown at a rate of nearly 20% per annum. The export volume of these crops has grown from just over 15,000 Metric Tons in the mid-1960s to nearly 50,000 Metric Tons in 1989, earning Kenya 1.678 trillion shillings in foreign exchange. This represents 12 to 15% of the total domestic export market of Kenya and all indications are that this horticultural sector of the export market will continue to expand in volume and value, particularly if inputs in the form of technology are generated and transferred to farmers.

The growth in the horticultural industries of Kenya can be attributed in large part to an imaginative and innovative private sector which has taken the initiative upon itself to seek out and obtain the most readily available technologies in order to expand and meet both local and international market needs. It should also be noted that horticultural crops for domestic consumption are estimated to be nearly one (1) Million Metric Tons annually, produced on approximately 90,000 hectares and providing an estimated 100,000 full time on-farm jobs.

The emphasis of this sub-component of the project is to increase Kenya's capacity to further expand the opportunities for export crops. Two or three high priority horticultural crops, or closely related groups of crops, will be selected for emphasis during Phase II.

### Outputs

The output for this sub-component of Phase II is: **Improved farmer usable technologies developed for horticultural crops.** The objective of project support is to improve KARI's ability to meet the research development and technology transfer needs for the rapidly growing horticultural crops industry, and to meet the increasing export opportunities. This component of the project will focus on design, planning, priority setting, and evaluation of horticultural research on those major commodities currently grown or which have the potential to be competitively produced in Kenya.

The existing research programs addressing horticultural crops have several fundamental problems, including:

- o The absence of a coordinated planning and priority setting process which is capable of setting national research priorities and serving as a repository for knowledge obtained;
- o The lack of a fully qualified staff of research scientists, well-versed in the latest technologies;

- o The need for a fully coordinated program of horticultural crop research at the KARI research station.

The project activities in Phase II will address those problems and issues directly by assisting the KARI Assistant Director for Horticulture in designing a national program for horticultural research that will address the recognized national priorities.

Indicators of output achievement for Phase II are:

- (1) Development and implementation of a functioning national process of planning, priority setting and coordination of research efforts on vegetables, temperate and exotic fruits, and cut flowers.
- (2) Limited evaluation of improved germplasm of two to three major vegetable crops groups to select materials that are adaptable to Kenya's varied agro-ecological zones. These materials should serve as the basis for future plant breeding programs for continued improvement of crops suitable for export and in-country use.
- (3) Development of an improved system of on-farm testing of both fruit and vegetable cultivars in each of the climatic zones of Kenya, under the direction of a qualified horticulturist who can evaluate crop performance on-site and provide the farmer with useful cultural information.
- (4) Identification for release to farmers of two or more improved varieties for each of four agro-ecological zones.

Inputs (see Annex J for details)

Technical Assistance	\$1,251,500
Horticulture Advisor (48pm)	
Short Term Consultants (12pm)	
Training (5 PhD, 5 MS)	\$1,018,500
Operational Funds	\$360,000
Commodities	\$510,000
Total	\$3,140,000

The focus of the horticulture effort supported by USAID will be on vegetable crops suitable for export. Limited assistance for fruits and flowers will be provided primarily via short-term consultants and procurement of laboratory and field equipment. Given the current level of KARI's horticultural research program development the need for long-term technical assistance in the general area of planning and management is considered minimal. KARI will however,

need technical support in fruit/vegetable crop management, post-harvest technology and floriculture.

One long-term horticulture advisor will provide overall guidance in the general area of planning and management, as well as key support in fruit/vegetable crop management and post-harvest technology. This senior advisor will also be expected to assist KARI in the establishment of research programs capable of collecting data useful to the germplasm improvement process and post-harvest management techniques. During the four year assignment, the horticulture advisor will have, in addition to the main responsibility of program and scientific support, a role in providing on-the-job assistance, training and guidance to the Kenya research officers in the horticulture program.

Twelve (12) months of short-term technical assistance will be provided in a number of areas, as needed. Examples of short-term technical assistance that might be needed include the following:

- o Crop breeders for specific vegetables;
- o Seed technologist, to include expertise in seed production techniques, seed storage, and seed viability;
- o Horticultural Economist, with expertise in marketing of horticultural commodities, to evaluate the markets for windows of opportunity;
- o Farming systems specialist.

For the horticultural program to be effective and productive, commodities including vehicles, field and laboratory equipment will be provided. Funding for recurrent program costs will also be provided to assure that the research is carried out in a timely manner and at adequate levels.

#### d. Small Ruminant Production

In a prioritization exercise where 53 commodity research programs in KARI were ranked, sheep and goat research was placed in third position after dairy and beef programs. It is therefore important that research in this class of livestock be carried out in order to increase production of meat and other products for domestic and export markets.

The Small Ruminant Collaborative Research Support Program (SR-CRSP) has had an active program in Kenya since 1980. The SR-CRSP is a collaborative effort of KARI and four U.S. land grant universities operating under a grant from A.I.D./W, Bureau of Science and Technology. The focus in Kenya has been on the development of a dual purpose goat production system appropriate for the limited

resource farms of Western Kenya. More recently the SR-CRSP has initiated a second project in Kenya which is designed to develop, in collaboration with KARI, a multivalent vaccine designed for goats and sheep. The focus of project support under Phase II will be on the DPG project as the vaccine development effort has been centrally supported and funded for a minimum of five years (1995). By contrast, the SR-CRSP will begin to phase its resources out of the DPG effort in 1991/92 with a full phase-out planned for 1995. Work in Western Kenya will end in 1993.

This date presents certain problems for KARI. First, the dual purpose goat breeding scheme will not quite have reached the point of being ready for commercialization by 1993. An additional two years of support will be needed to achieve that status. Second, as a result of KARI's reorganizational efforts during the first phase of the project, insufficient attention was directed toward integrating the very successful small ruminant research program into its organization.

The small ruminant project in Western Kenya is an outstanding example of a well thought out and carefully managed, multi-disciplinary farming systems research effort. It also incorporates many of the principles of program budgeting, wherein project leaders are given a budget thought sufficient to accomplish agreed upon objectives and then held accountable for meeting those objectives. In this context, the small ruminant program can serve as an excellent laboratory for KARI as it seeks to strengthen its farming systems research programs and implement a program budgeting system. If the work in Western Kenya terminates in 1993, KARI will not have had the opportunity to maximize the value of the program for its own institutional development.

The emphasis of this sub-component is to support a continuation of the small ruminant research initiated by the SR-CRSP while integrating the small ruminant program and systems approach developed by the SR-CRSP within its own organizational structure.

### Outputs

The output for this sub-component of Phase II is: **Improved farmer usable technologies developed for small ruminants.** Project assistance, coupled with the committed contribution of the SR-CRSP through 1993, will allow KARI to fully develop a new breed of goat which can be a source of meat and milk for limited resource farmers. With only slight genetic alterations this goat can be modified to suit more arid conditions, where a meat animal is preferable, or a more prolific milk producer in high potential agricultural regions. The animal will have been adapted to Kenya environmental and disease conditions and is likely to have considerable commercial appeal. In addition, KARI will be able to expose a significant number of its scientists to the farming

systems methodology employed by the SR-CRSP in western Kenya. These trained individuals will serve as a valuable resource for farming systems applications for other commodities.

The indicator of output achievement for Phase II is:

- (1) A new breed of goat which can provide meat and milk for limited resource farmers developed to the point of commercialization.

Inputs (see Annex J for details)

Technical Assistance	\$122,700
Short Term Consultants (6pm)	
Training (1 PhD, 2 MS)	\$330,000
Operational Funds	\$200,000
Commodities	\$140,800
Total	\$793,500

The principle input for this sub-component will be limited funding to continue the small ruminant research during and after the phase out of the SR-CRSP effort, primarily through provision of short-term consultancies in very specific areas. It is envisaged that approximately six months of support in the areas of nutrition management and breeding will be required. Additionally, support will be provided to train one PhD in nutrition and management and two MSc's in animal breeding, and for conducting of workshops. A limited amount of equipment including one vehicle, data processing commodities and possibly laboratory equipment will be provided.

### 3. Agricultural Research Fund

The emphasis and rationale for the Agricultural Research Fund (ARF) remain the same in Phase II as stated in the original project paper. Planning for the fund has now been completed and the first competitive grants have been awarded. The plans and implementation procedures are described in a publication called "Agricultural Research Fund" which was produced and distributed by KARI. In Phase II it is planned to continue support to this activity in order to enhance, improve and institutionalize mechanisms already established and to establish a set of procedures, policies and organizational arrangements whereby KARI can become a grant/contract seeker as well as a grant/contract provider.

The ARF is managed by a small secretariat staff responsible to the Director of KARI. The KARI Board of Management has appointed a ARF



Management Sub-Committee representing the public, the private and university sectors and USAID to oversee fund operations. Grantees are selected, in the case of contract research, on the basis of their technical scope of work and institutional capacity. A limited amount of "innovative research" will be solicited and selection will be on the basis of relevance to national priorities, scientific soundness and institutional capacity. Grant fund accounting and research monitoring will receive heavy emphasis; monitoring and evaluation is to be carried out by the Secretariat.

The key to making the ARF a viable, long-range institution is the ability to raise and manage funds. Simultaneous efforts will be made to raise funds for annual research grants and for a permanent endowment from which only income from the interest is spent annually. Phase II assistance will help with these efforts.

### Output

The output for this sub-component under Phase II is: **Operating Agriculture Research Fund supporting research activities undertaken by the private sector and the academic community.** Indicators of output achievement for Phase II are:

- (1) Other sources of support for the ARF match or exceed USAID contributions.
- (2) Operational M & E plan for individual grants.
- (3) Seventy-five percent of research grants completed on schedule.

### Inputs (see Annex J for details)

Technical Assistance	\$43,100
Short term Consultants (2pm)	
Operational Funds	\$21,000
ARF Grant Funds	\$350,000
Total	\$414,200

The inputs from the project in support of this sub-component are direct support for the ARF and short-term technical assistance. Consultants will be used to assist with planning, preparing promotional materials and campaigns, and Kenyan consultants to assist with legal matters. In addition, funds will be provided for the operational costs of the ARF.

#### 4. Administration

The principal contractor for the project, MIAC, will be responsible for the technical and managerial requirements of the project as well as its training needs. MIAC's team will include a strong U.S.-based management unit capable of fulfilling those financial and administrative requirements of the field team which can only be met from the United States. Furthermore, the U.S. administrative arrangements will include the capacity to arrange for the placement of significant numbers of participants in MSc. and Ph.D. programs at leading agricultural universities. In the field, the technical team will be supported by a high calibre administrative team consisting of an administrative assistant and an accountant, both local hire, under the direction of the Chief of Party. It is expected that the Chief of Party will also serve as the research management specialist on the technical assistance team.

The overseas training element of the project will be handled by MIAC staff in the United States. It is necessary that close coordination be maintained between this U.S.-based MIAC training operation, the technical assistance team in Kenya and with KARI management. It is vital that this training coordinator work on a continuing close basis with the KARI Office of Planning and Manpower Development.

Procurement of goods in the U.S. will follow the procurement plan outlined in this paper, as refined when necessary by KARI management working in association with members of the technical assistance team.

In addition to administrative costs related to MIAC, USAID/Kenya will be contracting at appropriate times for evaluations and a non-federal audit of the project. Section 3.C. discusses the evaluation and audit plans in detail.

#### Inputs (see Annex J for details)

Technical Assistance	\$1,355,800
Campus Coordinator, Project Administrator, Support staff.	
Office and Operational Expenses	\$619,500
Travel	\$117,400
Evaluation/Audit	\$250,000
Total	\$2,342,700

#### IV. Implementation Plan

##### A. Project Management

##### 1. Government of Kenya

Much progress has been made during the first phase of the project related to the development of management systems, review and initial prioritization of research projects and programs, training of staff, and in developing linkages and contacts with other research organizations and end-users of KARI generated research. Much of the effort in Phase II will be directed toward strengthening this initial effort. In particular it is essential that KARI, in coordination with the Ministry of Finance, assure the adequate and timely provision of funds. This of course must reflect KARI's own ability to plan and set research priorities. This action becomes urgent as a number of donors have indicated a willingness to provide operational research funds on an interim basis, provided KARI and the government show good faith in longer term resource allocation. In order to accomplish this objective it will be essential to, among other things, begin a process that will provide budget allocations at a ratio of approximately 40% for research and 60% for personnel. This level should be realized on an incremental basis by the end of the second phase of support.

Additionally, it will be important that KARI actively continue its examination of the existing structure and facilities with the intent to rationalize a system consistent with available resources. Plans must be put in place to either reduce the existing and excessive levels of staffing or to reallocate such staff to more productive and potential revenue generating activities.

To make effective use of project assistance under Phase II, it will be necessary for KARI to:

- o have developed and be prepared to implement program/ project planning and budgeting practices by individual researchers, centers and headquarters;
- o have an adequately staffed and functioning socio-economics unit with responsibility for research policy guidance and monitoring and evaluation functions;
- o have developed a manpower needs assessment and training plan under the guidance of the Assistant Director for Human Resource Development and Training;
- o closely coordinate research management activities undertaken by both project technical assistance staff and ISNAR through

a memorandum of understanding with provision for development of annual work plans.

The above actions are consistent with those identified in the 1991 World Bank led multi-donor review and with KARI's own projected NARP-Plan of Action, prepared in early 1992. What remains now is to further develop and actively implement these plans.

Regarding the GOK's role vis-a-vis the AID project, the vast majority of service to be provided by the project will be obtained through a host-country contract with MidAmerica International Agricultural Consortium (MIAC). KARI is empowered by the Government of Kenya to enter into contractual agreement of goods and services. It is anticipated that all technical assistance, most commodity procurement and the majority of training will be obtained under the MIAC contract.

Liaison between the AID technical assistance team and KARI on key administrative issues will be conducted primarily between the Director of KARI and the MIAC Chief of Party. Members of the technical assistance team assigned to research stations in the field will liaise principally with the Officers in Charge of the stations to which they are assigned. These station heads are also the designated national coordinators of key research programs, namely the horticulture, maize and sorghum/millet commodity programs.

## 2. USAID/Kenya

Responsibility for USAID/Kenya's oversight of the project will rest with the Mission's Office of Agriculture which will be supported as required by other offices of USAID/Kenya and REDSO including the Mission's Office of Projects, Controller and the Regional Legal Advisor. Within the Office of Agriculture, a Project Officer working under the direction of the Chief of the Office will be assigned line responsibility for monitoring project progress from both an administrative and technical perspective.

In Phase II of the project the role of the Project Officer and other mission staff will become more heavily focused on monitoring and evaluation. USAID/Kenya, in association with the GOK, will develop the scopes of work for periodic full-scale evaluations of project progress. It is planned that USAID, working closely with KARI, will contract directly for services to execute these major evaluations.

## B. Procurement Plan

Goods, services and support under Phase II of the project will be provided through four general contract or grant mechanisms as follows:

- o The existing Host Country Contract between KARI and MIAC will be amended to add technical assistance, participant training, commodity procurement, administrative support and a small portion of operational funds totalling approximately \$13,150,000. AID/W on March 8, 1991 approved a waiver to allow MIAC to assist with the design and implement Phase II under an extension of this contract. The USAID/Kenya Acting Mission Director determined in writing on May 8, 1991 that KARI has the technical capability necessary to carry out host country contractual procurement. It is planned that the contract amendment will be presented in draft for USAID/Kenya approval by April 30, 1992.
- o The balance of operational support funds totalling an estimated \$1,000,000 will be provided directly to KARI through standard grant advance procedures. KARI will liquidate these advances based upon presentation of appropriate expenditure documentation.
- o Grant support for the Agriculture Research Fund component totalling \$350,000 will be handled in the same manner as under Phase I - through Mission advances to KARI who will in turn follow the established procedures in making competitively awarded research grants to scientists. These procedures include mechanisms for reviewing proposals, making awards, monitoring progress and insuring accountability for the funds. KARI will liquidate the advances based on appropriate expenditure documentation.
- o Evaluations and audits costing a total of \$250,000 will be performed by U.S. firms (evaluations) and Kenyan firms (audits) on the basis of direct USAID/Kenya cost reimbursement contracts.

The following table summarizes the planned source/origin for project funded goods and services. U.S. source/origin procurement has been planned to the maximum extent practicable and totals approximately 69% of Phase II costs. \$600,000 is budgeted for 935 source/origin goods, including \$300,000 for project vehicles. This vehicle procurement plan is based on the need for right-hand drive vehicles with locally available spare parts and maintenance/repair support. Most vehicle procurement is scheduled over the first three years of the project, and the availability of suitable U.S. source/origin vehicles will be reviewed on a continuing basis before orders are placed.

## PROCUREMENT SOURCE/ORIGIN, IMPLEMENTATION/FINANCING PLAN (\$000)

Item	000	935	Kenya	Totals	Method of Implementation	Method of Financing
MIAC Contract					Host Country Contract	Direct Pay
Technical Assistance	4,876		872	5,748		
Training	3,100		627	3,727		
Commodities	766	600		1,366		
Operational Support			216	216		
Administration	1,208		885	2,093		
Sub-totals	9,950	600	2,600	13,150		
Operational Support			1,000	1,000	Grant Agreement	Direct Pay
Agricultural Research Fund			350	350	Grant Agreement	Direct Pay
Evaluation/Audit	200		50	250	PSC, IQC	Direct Pay
Totals	10,150	600	4,000	14,750		

## C. Monitoring/Evaluation/Audit

### 1. Monitoring

Monitoring the operations of the total agricultural research program will be the function of the planning and evaluation unit which is part of the reorganized KARI management structure. This unit will be responsible for the formulation of reporting documents to be completed by the National Agricultural Research Centers (NARC's) and the Regional Research Centers (RRC's) network and for the development of narrative reports and statistical programs which will indicate the impact of research efforts. A program of field visits for the verification of written materials supplied by the NARC's and RRC's will also be developed. The MIAC short-term technical assistance specialist provided for under the monitoring and evaluation activity will develop a detailed M & E plan and establish reporting and networking mechanisms between the headquarter M & E unit, the NARC's and RRC's Centers. The M & E specialist will assist KARI in the development of appropriate impact assessment systems as well as establish baseline data.

There is need to create research baseline information from which the Phase II project can be monitored and evaluated. The baseline can be created for KARI as an institution, for each NARC and RRC, or for each research program or group of related programs. The baselines, whether created for programs, RRCs, NARCs or KARI as whole, need to have compatible (although not necessarily identical) indicators, therefore the framework should be essentially the same. While compatibility will ensure that data from field level will feed into system up to the HQ level, the M & E personnel should allow some degree of flexibility in selecting the indicators to allow for the capturing of unique or certain prominent characteristics of a program or center.

Another important factor in baseline formation is that the process must be replicable, cost-efficient and within the capacity of KARI to manage. This has bearing for the overall M & E process, i.e., it must be within KARI's capacity to implement the M & E function largely within its routine project management. It should not be seen as an additional short-term component which is extraneous to the routine research activity. The M & E function should be incorporated in all aspects of research activity and management, such that even at on-farm, disciplinary, commodity program or research station level, there exist built-in monitoring mechanisms. In this way a sustainable evaluation process is built into the system.

The USAID/Kenya Agriculture Office will be involved in monitoring the management and technical results flowing from the A.I.D.-financed project. Frequent liaison with the Director of KARI and

the management team stationed at the national headquarters will assure monitoring of the management support and training aspects of the project. Contact on a regular basis with the management unit of the Research Fund will be essential to review Fund-sponsored activities. A Mission representative will also be a voting member of the Project Selection Committee for those activities underwritten by the Research Fund. Field visits by the USAID project officer and other concerned Mission staff will be necessary to review the technical work being undertaken for maize, sorghum millet, and horticulture to review the development of improved management systems at the NARC's level.

## 2. Evaluation

This project is a long-term effort which will require short-term and long-term impact evaluations to assess progress against stated goals, identify any key constraints and to suggest modifications as required to overcome those constraints. Changes in environmental, political, bureaucratic and economic conditions in the country over the project period of five years will also require periodic review and assessment to determine their impact on the operation and outcome of project activities. USAID/Kenya will conduct periodic reviews of progress towards achievement of project goals. In addition, mid-term and end of project evaluations will be done involving an external evaluation team. The formal evaluations will be conducted by a team of specialists who will have no contractual linkages to the firm(s) responsible for the execution of the project. USAID will contract directly for the services of the evaluation teams.

Phase I of the project concentrated a significant amount of its efforts on the upgrading of the management and planning functions of the Kenyan research system. Phase II will concentrate increasingly on the management and technical products of the commodity research programs being supported by A.I.D. as well as the products being produced under the Research Fund. Future evaluations will be able to provide an assessment of Phase I as well as provide a definitive impact assessment of accomplishments of all aspects of the life of the project. Results of these assessment will form the basis for the future of USAID's efforts to support agricultural research in Kenya.

The following four areas will be addressed under the M & E initiative:

### (1) Institutional Base

This is the overall institutional capacity and capability to generate and transfer appropriate technology to the agricultural sector (especially the smallholder). Under this category, all aspects of KARI (from Headquarters to NARCs and



RRCs) will be monitored and evaluated, i.e., the research management structure; human, technical and financial resources; budget and resource prioritization and allocation across programs; productivity and professionalism in research programs and units; research evaluation and planning procedures; linkages with technology dissemination agents and users and with other national and international institutions.

## (2) Technology Generation and Transfer

KARI will also monitor and evaluate the capacity and capability of the institution as whole, to generate appropriate technology for transfer to the agricultural sector, i.e., farmers (again focussing on smallholders), seed companies and other clients. The national extension system is critical to technology transfer to end-users, and for feedback from the end-users. Technology diffusion will also depend on the inputs distribution system and other factors such as credit. The main aspects to be monitored here include development and release of new varieties, release of recommendations for new and existing technologies, intensity of farm-level research, and mechanisms established to facilitate transfer of research results.

## (3) Intermediate Impact

KARI will need to measure progress made to date (for period under review) in the transfer of technologies to the agricultural sector. The transfer of technology will be measured primarily as adoption of technology, and the extent of area coverage. The monitoring team would also attempt to identify factors associated with progress so far. To complete the picture, constraints (and the degree of severity) to the adoption of technology will also need to be studied, e.g., soil conditions, agroecological restrictions, availability of farm inputs, access to markets, adequacy of storage and processing facilities and price policies.

## (4) Long-term Impact

The goal of the project is to increase agricultural productivity and farm incomes, especially in the smallholder sector. The generation and transfer of appropriate technology is one of the means of achieving this goal. The M & E Unit's objective under this category would be to attempt to answer the questions: **How has agricultural research contributed to (or increased) food security through increased agricultural productivity? How has research in food crops enhanced household food security through increased on-farm productivity or increased availability and access (more affordable) from a global increase in productivity? How has research in cash crops enhanced farm incomes and therefore allowed non-self**

**sufficient households to attain food security by purchases from the markets?** Such questions should be framed in a broader picture of macroeconomic, policy and resources environments. Impacts are then to be sought in the areas of:

- o agricultural productivity, e.g., increases in agricultural sector value added, changes and stability in yields, increases in farm incomes and profits, changes in farming systems and land use to higher value production.
- o improvement in food security, e.g., per capita food availability, stability of agricultural production of food staples.
- o Other areas of interest may include changes in the agro-processing industry, and in national nutritional status.

The areas covered in the above narrative are illustrative, and therefore do not completely cover all the aspects to be monitored and evaluated by KARI. Similarly the framework is illustrative but it is also convenient for providing a conceptual progression in research impact evaluation from institutional capacity to national objectives. An M&E plan for the five year Phase II will be developed by KARI prior to the completion of Phase I.

### 3. Audit

The Phase II budget provides \$50,000 for a non-federal close-out audit of the project. In addition, the two main implementing organizations, KARI and MIAC, who are responsible for almost all project activities and expenditures, will be audited annually in accordance with the new Inspector General's guidelines on recipient contracted audits. This audit coverage is considered more than adequate to ensure financial accountability and control of A.I.D. funding resources.

#### D. Conditions Precedent and Covenants

The following proposed Conditions Precedent and Covenants have been developed by USAID/Kenya in consultation with KARI and MIAC. They address key concerns over the budgetary implications of direct A.I.D. support for KARI operational expenses and the plan in Phase II to more closely tie training to specific KARI program requirements.

##### 1. Conditions Precedent

The amendment to the Project Grant Agreement shall contain conditions precedent to disbursement of funds authorized providing in substance as follows:

- a. Prior to disbursement of funds in support of recurrent costs which shall have been incurred during the periods from July 1 to December 31 and from January 1 to June 30 in any calendar year, KARI first will have provided to USAID, and USAID will have approved in writing, detailed program/work plans which will include program budgets for each such period. The plans will be submitted to USAID on or before May 31 and November 30 of each year, to allow time for USAID review and written response.
- b. Prior to disbursement of any funds for expenses related to any training program commencing after July 1, 1992, KARI first will have provided to USAID, and USAID will have approved in writing, an organizational manpower development plan that reflects existing levels of trained staff and future organizational needs for the period remaining in the project.

## 2. Covenants

The amendment shall contain covenants providing in substance as follows:

- a. KARI will provide to USAID on an annual basis budgetary information which will demonstrate an incremental but steady movement toward a 60/40 ratio of personnel to operational costs by the end of the project.
- b. KARI will demonstrate through a continuing review of existing research facilities and personnel the rationalization of a research system consistent with all available resources. Special attention should be directed to the reduction of staff and redeployment of staff to other potentially productive and revenue generating activities, and an examination of required research and production facilities. USAID should be advised on an annual basis of the status of such review and specific actions taken.
- c. KARI will within six months from the beginning of Phase II activities submit to USAID a plan which will closely coordinate research management activities undertaken by both project technical assistance staff and ISNAR staff. Such a plan should be developed in consultation with ISNAR and project staff, be incorporated within annual plans of work and be formalized within a memorandum of understanding.
- d. KARI will within six months of the start of Phase II activities have an adequately staffed and functioning socio-economics unit with responsibility for research policy guidance and monitoring and evaluation functions.

## NARP Phase II Implementation Plan

	1992		1993				1994				1995				1996				1997		
	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
<b>Research Planning, Management</b>																					
Management Advisor	---																				
M&E Design/Implementation	---																				
Admin Systems Decent.		---																			
Admin Systems Support																					
Short-term Specialists																					
Ph.D. Training																					
MSC Training																					
Short-term Training																					
Commodity Procurement																					
<b>Commodity Programs</b>																					
Maize Breeder																					
Systems Agronomist/Maize																					
Sorghum Breeder																					
Horticulturalist																					
Short-term Specialists																					
Ph.D. Training																					
MSC Training																					
Operational Support																					
Commodity Procurement																					
<b>Agricultural Research Fund</b>																					
Short-term Specialist																					
Grants Awarded																					
Grants Completed																					
Operational Support																					
<b>Project Administration</b>																					
CP - Program Budget	---		---				---				---				---				---		
CP - Training Plan	-----																				
Evaluation/Audit																					

## V. Financial Plan and Cost Estimates

### A. Basis for Cost Estimates

Most of the Research Planning and Management, Commodity Research Program Support and Administration costs, and a portion of the Agricultural Research Fund costs, are for services included in the MIAC contract. Cost estimates for the MIAC contract are based on Phase I experience with salaries, benefits, travel and support requirements, MIAC overhead and G&A. Phase II costs include a 5% annual inflation factor. Cost estimates for the planned evaluations and the non-federal audit are based on recent USAID/Kenya experience.

Another major cost component for Phase II is Operational Support for recurrent KARI costs. As part of the Phase II PP amendment development process, Price Waterhouse was contracted to prepare a recurrent cost analysis for KARI. KARI recurrent costs were compared to present GOK funding levels and KARI revenue generation to determine the annual budget shortfall over Phase II of the project.

### B. GOK Contribution

The estimated Government of Kenya contribution to Phase II of the project is based on a joint KARI/MIAC/USAID review of budgeted and in-kind resources to be provided over the five year period. To support Participant Training, the GOK will be financing the salaries of participants while in training programs and one-half of their international air fares. For Commodities, the GOK will pay clearance and equipment installation costs. The government's largest contribution is for the salaries of professional and support staff coordinating the project, counterparts to the MIAC advisors and other headquarters and research station staff involved in operations directly related to project activities. In addition, the GOK will provide some local cost support for the Ag Research Fund, for construction and for evaluations.

## SUMMARY OF A.I.D. PHASE II COSTS BY COMPONENT AND YEARS (\$)

	92/93	93/94	94/95	95/96	96/97	LOP Totals
Research Planning and Management	243,500	723,600	696,000	693,500	633,900	2,990,500
Commodity Research Program Support						
Maize	432,800	703,700	748,500	793,000	543,400	3,221,400
Sorghum and Millet	313,200	477,300	369,100	456,500	231,700	1,847,800
Horticultural Crops	115,500	649,400	937,500	858,900	578,700	3,140,000
Small Ruminants	90,600	112,000	269,600	221,800	99,500	793,500
Sub-totals	952,100	1,942,400	2,324,700	2,330,200	1,453,300	9,002,700
Agricultural Research Fund	0	21,100	279,000	57,000	57,000	414,100
Administration						
MIAC Administration	408,700	416,000	409,200	422,400	436,400	2,092,700
Evaluation/Audit			75,000	100,000	75,000	250,000
Sub-totals	408,700	416,000	484,200	522,400	511,400	2,342,700
<b>TOTALS</b>	<b>1,604,300</b>	<b>3,103,100</b>	<b>3,783,900</b>	<b>3,603,100</b>	<b>2,655,600</b>	<b>14,750,000</b>

	1992	1993	1994	1995	1996	LOP Total
Proposed Obligation Schedule	2,000,000	2,800,000	3,000,000	4,000,000	2,950,000	14,750,000

## SUMMARY OF OVERALL PROJECT COSTS BY EXPENSE CATEGORIES (\$000)

Category	Phase I			Phase II			Combined LOP		
	A.I.D.	GOK	Total	A.I.D.	GOK	Total	A.I.D.	GOK	Total
Technical Assistance	4,034	0	4,034	5,748	60	5,808	9,782	60	9,842
Training	4,322	320	4,642	3,727	650	4,377	8,049	970	9,019
Commodities	2,106	382	2,488	1,366	125	1,491	3,472	507	3,979
Operational Support	0	666	666	1,216	1,325	2,541	1,216	1,991	3,207
Construction	470	0	470	0	85	85	470	85	555
Research Fund	630	163	793	350	50	400	980	213	1,193
Local Personnel	0	4,855	4,855	0	2,840	2,840	0	7,695	7,695
Evaluation/Audit	85	50	135	250	40	290	335	90	425
Administration	3,553	28	3,581	2,093	170	2,263	5,646	198	5,844
Contingency & Inflation	50	0	50	0	0	0	50	0	50
Totals	15,250	6,464	21,714	14,750	5,345	20,095	30,000	11,809	41,809

## VI. Summary of Analyses

### A. Institutional Analysis

This analysis updates that done for the original project planning documents and adds comments on the subjects of sustainability and absorptive capacity.

In the five years since the time of the original analysis, KARI has moved a long ways towards being a viable, sustainable research institution. It has a well established administrative structure, a functioning governing board and a strong commitment from the donor community to help it develop further. Key administrative support systems have been installed and are fully functional and KARI personnel are beginning to assume full responsibility for their operation and maintenance. Human resource capability has increased although there is still a need for additional training throughout the organization.

There are some points of concern which will need to be addressed if the new KARI is truly to achieve full sustainability. Among these are the issues of staff recruitment/retention, revamping the resource reallocation system and institutional renewal. However, by far the most serious is the area of financial viability and whether the GOK can provide operational support for research in the amounts needed and in a timely manner. This is essential for a research organization to be productive. The track record over the last three years is not encouraging. Neither core GOK operational support (salaries are less of a problem) or counterpart funds channeled through the GOK have been timely in their arrival or sufficient for the amounts needed.

KARI has taken some positive steps to address this problem by implementing steps to reduce its reliance on the GOK for operational funds. Foremost among these is to dramatically increase its income from the sales of products produced by its farms and centers. Data indicate a substantial rise in this revenue source over the past three years and management feels that a further increase is well within reach.

Second, KARI now receives a single line item budget from the GOK for its recurrent budget. Potentially this means that if personnel costs can be reduced (everyone agrees that KARI has too many employees), then funds could be reallocated from personnel to operations. This will take time but represents a very positive development with great potential for the future.

In Phase I KARI demonstrated a capacity to absorb significant amounts of long- and short-term technical assistance and long-term degree training. While the mix of inputs will change in Phase II, the type of inputs and their relative magnitude will be much the



same as in Phase I. The most significant difference will be the significant increase in the level of effort devoted to short-term training. However, in their involvement with other donors KARI has shown a capacity to make good use of this type of assistance. Overall, absorptive capacity, in terms of the inputs planned for Phase II, is not a source of concern.

## B. Economic Analysis

A detailed economic analysis was made of the entire project and is included in the original Project Paper. The approach taken was to perform an indicative break-even analysis for the life of the project. The analysis done for this amendment did not attempt to up-date this analysis. Instead, the approach taken was to review the explicit assumptions made in the original analysis in light of the performance of KARI and the agricultural sector over the last few years to determine if the break-even analysis is still valid.

An analysis of the trends in the crops of interest to this project, i.e. maize, sorghum, millet and horticultural crops, indicates a general growth in production due to both increases in area planted and improved yields. The growth registered is well below the target growth for agriculture set by the Government of Kenya.

In addition to benefits attributed to the growth in yields, there have been improvements made in the planning and management structure of KARI which have resulted in some savings.

The original model used for the break-even analysis was based on the following assumptions:

- o a technology generation process which improves the yield of adopted acreage by 2.75% in the initial years increasing progressively to 3.5% in 2002;
- o an adoption rate which increases from 0.8% in 1992 to 25% in 2007; and
- o incremental cost savings to KARI as a result of improved planning and management systems beginning at 0.5% of the cost of the KARI proposed program in 1990 and increasing to 5% in 1999.

A re-run of the break-even model updating only the costs to A.I.D., indicates that the project will perform better than originally estimated. This would be supported by a recent study which estimated the average rate of return to maize research in Kenya between 1955 and 1988 to be 68 percent.

The projected gains in production for maize are feasible. However, two problems exist which, if not remedied, will effect the

production increase in the future. First, to meet projected increases in yields and to assure the maximum benefits from the project, KARI will need to increase its adaptive research capability and produce more technologies which are adapted to specific agro-ecological and socio-economic systems. Secondly, improved linkages are needed with the extension services to promote the dissemination of the adapted technologies.

### C. Social Soundness Analysis

The social soundness (SS) analysis for the original project paper is updated with more recent information and a more deliberate attempt is made to comment on how NARP would impact women. In general, the population and demographic trends noted in the SS have not changed markedly since 1986, although some recent data seems to indicate that the population growth rate is declining, albeit slowly, and that there is a clear preference by women for smaller families. Rural to urban migration patterns, have, if anything, grown stronger in the last five years. The continued breakup of land holdings into smaller and smaller units has continued to occur in many areas of Kenya and close to one million households now live on less than 1 hectare of land.

Approximately one third of farm households are headed by women. These households tend to be somewhat poorer than those headed by men and they are also more dependent on farming as the primary source of family income. Interestingly, women headed households are no different than men in terms of their willingness to make use of "improved" equipment, commercial and labor inputs.

Maize remains the major staple food crop in Kenya but with the expansion of the country's population into the arid and semi-arid zones there is a need to develop the production of commodities suitable to those regions. Sorghum and millet are good examples. Horticultural crops are produced by a broad spectrum of the population of Kenya and the fact that only 5% of the production is exported (15% of the value) leads to the conclusion that an improvement in the horticultural base will positively impact a broad cross-section of the population, consumers and producers alike.

Women are the mainstay of the agricultural labor force and have the main responsibility for labor on food crops. Cash crops have traditionally been the province of men although with the continued outflow of men to urban areas a change may be underway in these traditional roles. As research programs in maize, horticulture and sorghum/millet evolve, special attention will need to be given by KARI's socio-economists to how new technologies are impacting different groups in the population. The strengthening of KARI's capabilities in the area of socio-economics and the incorporation of the farming systems approach into KARI's adaptive research

effort is a important investment that will help insure that the interests of all Kenyan's are kept in mind during the research process.

#### D. Financial Analysis

The financial analysis for the project amendment reviews experience from the first five years of the project based on AID evaluations, joint-donor reviews and a recurrent cost analysis undertaken by a consultant, as well as recent agreements between Treasury, the Ministry of Research Science and Technology (MRST) and KARI under which changes required to improve KARI's financial viability are being implemented. The principal conclusions emerging from this analysis include:

- o The need to establish stable and predictable funding levels for both KARI's recurrent and development budgets.
- o The need for KARI to significantly strengthen its internal financial management capacity in order to lay the groundwork for a systematic approach to program-based budgeting.
- o The need for donor investments in operational research funds during Phase II to assure the stable funding to enhance KARI's technology generating capacity.

##### 1. GOK Budget Support for KARI

Each assessment of KARI over the course of Phase I has highlighted KARI's financial problems and their influence on its ability to implement research programs on a timely basis. KARI's financial difficulties have been primarily due to: (a) inadequate and untimely releases of funds by the Ministry of Finance; and (b) the fact that KARI has had to settle substantial debts of which a considerable portion were inherited at the time of reorganization.

Following the November-December 1991 Joint Donor Progress Review, several actions have been implemented by the Ministry of Finance which address core issues of KARI's financial constraints:

- o The Ministry of Finance has significantly increased KARI's recurrent cost allocations, substantially improving KARI's ability to address its debt problem and to fund a greater portion of operational costs.
- o The Ministry of Finance has approved KARI's retention of internal revenue generations to be applied to operational research purposes, and
- o After protracted delays KARI has begun to access a KSh 120 million special account provided under an IBRD/IPA agreement

which allows KARI to rapidly expand its on-farm adaptive research program. With complementary resources from other donor-specific commodity and factor research programs, KARI will for the first time in its existence have access to adequate funds for operational research.

As the result of this progress over the past eight months, KARI has reduced its total debt from KShs 74.1 million to approximately KSh 7.0 million (as of March 1, 1992).

## 2. Program-Based Budgeting Systems

Recent progress in resolving the severe financial constraints experienced under Phase I combined with progress in establishing internal financial management systems have positioned KARI to more aggressively develop its program-budgeting systems. KARI's preparation of the workplan entitled "Kenya's Agricultural Research Priorities to the year 2000" and development of specific commodity and factor research programs and budgets, marks an initial stage for the establishment of program-budgeting systems. Multi-institutional reviews of KARI's programs in maize, sorghum and millet, horticulture, range management, dairy and livestock health have significantly strengthened priority setting and program formulation in these research areas. These programs have also received adequate operational funds on a timely basis for the first half of 1992. These efforts during the past year now provide a solid foundation for KARI to institutionalize project/program budgeting practices by commodity program coordinators, research centers and headquarters in preparation for the 1992/93 fiscal year. KARI's workplan, submitted recently to the donors, includes this systematic approach to research budget development for timely completion prior to June, 1992.

## 3. Sustainability

Finally, the issue of sustainability of the research system is of critical importance to the GOK and donors involved with the KARI program. Recent changes enacted by Treasury which: (a) provide much improved levels of GOK funding; (b) allow KARI to retain internally generated earnings; and (c) provide KARI much greater financial allocative flexibility through the single line-item development budget, are marked improvements over past operating procedures.

At the same time, KARI's long-term viability in institutionalizing the necessary capacity for continuous generation of technologies which are linked to intended beneficiaries will require continued donor investments in operational research activities. Over the past three years donors have provided roughly 50 percent of KARI's total budget. KARI's objective is to reduce this level to 25

percent during the next five years. Efforts to reduce dependency on both the GOK and donors include the aforementioned activities in contract research and commercial revenue generations from KARI operations. Additional efforts are already underway to expand KARI revenue from levies on sales of KARI-developed seed varieties and technologies. During Phase II USAID, in collaboration with KARI, will also explore longer term financial support mechanisms by donors such as endowment funding, which would increasingly free the system from the politically sensitive budget process and ensure greater stability and predictability in funding agricultural research in the future.

#### E. Environmental Analysis

The original IEE for the project covered the complete 10 year program that is now Phases I and II. The IEE proposed a categorical exclusion for the Research Planning and Management and training components, and a deferred threshold decision for Commodity Research Programs and the Agricultural Research Fund. USAID/Kenya was advised by State 389802 dated December 24, 1985, that the IEE had been approved by the Bureau Environmental Officer and Legal Advisor.

A further report on Environmental Considerations was prepared for the original PP and provided recommendations on handling of pesticides, research methodologies and orientation, preferred pesticides for maize, sorghum and millets, and environmental review procedures for Research Fund proposals. All of these recommendations have been incorporated into the management procedures for the project and will be continued in Phase II.

## ANNEX A

### INSTITUTIONAL ANALYSIS UPDATE

#### I. Introduction - Phase I Review

The original institutional analysis summarized three separate studies. Some issues were addressed in all three reports but each had at least one unique item. Each issue is summarized here and a brief update provided regarding changes in the situation during the past five years. New sections have been added which comment specifically on the issues of "absorptive capacity" and "sustainability."

##### A. Research Organization

A major section of the original analysis was devoted to the organization of KARI. At that time the legislation creating a "new KARI" with a unique parastatal status had yet to be passed and implemented. As a result it was USAID established a condition precedent that the new KARI be operationalized with a functioning Board of Management.

KARI, in general, is following the plan outlined for it. There have been some minor variations from the proposed organizational structure due in part to a lack of qualified personnel. The legislation creating KARI did not specify what Ministry was to be its home which led to considerable concern during the first three years of the project. However, after three changes, KARI now seems to be well established within the Ministry of Research, Science and Technology where it receives strong support.

Some other organizational innovations were also suggested including national planning committees for each major research program (e.g. maize), annual conferences of all researchers and advisory committees for each center. Action on these recommendations has lagged although a national maize planning group has been organized and has had one meeting (November, 1990). Center advisory committees have also been named and many are functioning effectively.

##### B. Research Program Formulation

This was another major topic in the original planning documents. In effect it was recommended to install a program budgeting system at three NRC's and one RRC. Two reports expressed concern about excessive decentralization of budgeting. KARI has addressed this

issue and budget management and resource allocation decisions are now made at the headquarters level.

However, program budgeting has not been implemented as KARI has lacked, until recently, a clear picture of the scope of the research projects which are currently active. It also lacked the accounting system to track budget/expenditures by project.

All the essential ingredients are now in place and during 1991-92 the first steps to implement program budgeting will be taken. This will be an evolutionary process as significant resource reallocations can only be made in modest increments over a period of several years.

#### C. Supervising, Monitoring and Evaluation

KARI has made excellent progress in improving reporting channels and lines of authority and in developing position descriptions which include statements on authority and responsibility. The importance of monitoring and evaluation is recognized in KARI. Support for the strengthening of this activity is a high priority for Phase II.

#### D. Human Resources

A number of manpower issues were spelled out in the original analysis including: Inaccurate data on numbers and types of personnel; limited control over manpower resources; shortage of qualified technical and scientific staff; difficulty in recruiting and retaining qualified personnel; and, lack of a merit system for rewarding productive employees.

KARI has made considerable headway in addressing these issues. It is well on the way to having a complete and accurate human resource data base which will form the cornerstone of a comprehensive human resource development training program. A new scheme of service has been put in place which should help with the recruitment/retention problem for scientists and administrators and similar steps are being planned for administrative/clerical and technical support personnel.

#### E. Research-Extension Linkages

Nearly everyone who has commented on the agricultural development situation in Kenya has spoken to the issue of research-extension linkages. It is probably safe to say that the uncoupling of KARI from the Ministry of Agriculture did nothing to improve this situation. However, a low point may have been reached some months back and a number of positive steps have been taken to build a firm

basis of cooperation between KARI and the MOA and MLD which house the extension services. Specifically, KARI has signed a formal memorandum of agreement with the two ministries which spells out who will be responsible for what and allows KARI to access Ministry resources in order to expand its adaptive research and on-farm research programs as well as its training programs for extension agents.

Efforts are underway (World Bank funded) to strengthen this linkage from the extension side and Phase II of the USAID/KARI project will work at reenforcing the linkage from the research side.

#### F. Farming Systems

The original institutional analysis was critical of KARI for the way in which it had tried to incorporate a farming systems perspective into its research programs. This has been addressed by KARI and there seems to be a much better strategy in place now which will allow KARI to take advantage of the benefits the FS approach has to offer. The primary constraints at the moment are a lack of human resources with knowledge of the approach and the need for operational funds. Both will be addressed in Phase II.

#### G. Linkages

The original analysis was very critical of the relationship (or lack thereof) between KARI and other entities involved in agricultural research in Kenya. Some of these have been explicitly addressed in Phase I.

First, strengthening the linkage between KARI and the private sector and universities was a major objective underlying the creation of the agricultural research fund. The fund is just now becoming operational and further strengthening of the fund is planned for Phase II. Also, Phase II will seek to help KARI develop its capacity to attract and manage external funding. Given the rich resources of the agricultural sector in Kenya the possibilities of significant support would seem to be high.

Second, KARI was faulted for the lack of better linkages with NGO's. This situation has not changed significantly but will receive explicit attention in Phase II.

Finally, a stronger set of linkage arrangements with the IARCs was encouraged. The importance of this linkage is recognized by KARI and some positive steps have been taken. For example, KARI, Egerton University and CIMMYT are cooperatively offering a three month course on crop management. It is expected that the course will be offered several times each year for the next three years with "students" being drawn from the East African region. Other,



less formal, cooperative activities are also underway but this will need to be an area which receives constant attention in the future. Part of the problem lies in the different mandates of IARCS and NARS which are not easily resolved. The recommendation in the original project documents to have a full-time administrator at KARI address the linkage issue as his/her only responsibility has not been implemented and does not seem appropriate. As KARI's programs develop and mature a strengthening of these relationships as partnerships of equals will take place.

## II. Absorptive Capacity of KARI for the Planned Inputs

Throughout Phase I KARI has demonstrated a capacity to absorb long-term and short-term technical assistance, training and the other inputs which make up a project of this sort. While the mix of inputs will change somewhat in Phase II (e.g. an increased emphasis on short-term training), there is every reason to believe that KARI will be able to effectively make use of the resources available through the project. A much stronger foundation will exist for the Phase II inputs than was true for Phase I which will only serve to increase the probability of success. A few comments on each component are offered.

### A. Planning and Management

The inputs here remain much the same as for Phase I although there will be some change in emphasis. A new long-term position will focus on strengthening KARI's capability to do monitoring and evaluation. This person will complement the role of the long-term research management advisor. The latter position has been working with the KARI Director since the initiation of the project.

The other major change in this component lies in the nature of the short-term assistance to be provided. In Phases I a large amount of short-term assistance was provided to design and install administrative support systems and train KARI personnel in their use. By the time Phase II begins this task will have been largely completed. While some additional development-enhancement-maintenance activities are planned for these system, attention will be directed towards helping managers make use of the systems as resources for decision making. KARI's leadership has matured to the point where they perceive a need for this kind of assistance and they increasingly are requesting assistance to solve a particular problem. Considerable attention will be given in Phase II to helping KARI assume greater responsibility for initiating requests for assistance and monitoring what is provided.

#### B. Commodity Programs: Maize and Sorghum/Millet

KARI demonstrated a capacity in Phase I to absorb a large amount of both long-term technical assistance and long-term degree training in these two commodity research areas. Overall, there will be less long-term assistance and long-term training in this area in Phase II and a greater reliance on short-term consultants and short-term training to maintain scientific currency and improve the skills of technical officers. With the return of significant numbers of MS and PhD trainees early in Phase II a solid scientific base will exist which will support this approach. If the mechanisms to improve the flow of funds to research projects are improved the productivity of these programs will increase significantly during Phase II when there were significant constraints caused by so many research officers being sent for training.

#### C. Commodity Programs: Horticulture

Horticulture will be new initiatives in Phase II. The absence of an organized and focused horticulture research program and a lack of trained personnel will require a significant amount of long-term technical assistance and degree training. Essentially, for the first three years of Phase II, the long-term advisors will be charged with defining the scope of the program and initiating projects within it. In year 3, with the return of the first MS students, their role will increasingly shift from implementor to advisor and with the return of the Ph.D. students the remaining advisor will increasingly serve as a consultant and mentor. KARI has shown in both the low-mid altitude maize program and the sorghum-millet program that this strategy will work and by the start of Phase II the long-term personnel supporting those programs will have started the gradual transition from implementor to advisor to consultant/mentor.

#### D. Dissemination of Research

Limited direct assistance was provided in Phase I for this area but an expansion of effort is planned for Phase II. KARI is committed to making greater use of the farming systems approach and has expressed the need for a long-term advisor to assist them to strengthen their use of these methodologies. The World Bank is also making investment in this area and the proposed USAID inputs have been structured with this in mind. KARI already has a number of research officers who are assigned to work in this area and only limited training is planned, nearly all of it of the short-term, in-country nature. KARI should have no difficulty in absorbing these inputs.

Phase II will see a more concerted thrust designed to assist KARI to produce printed and electronic material of immediate value to

those organizations who are working in the technology transfer arena. Besides the extension services, these would include private firms and NGO's and PVO's. KARI has already created a unit which is charged with this responsibility and Phase II will work to strengthen the capabilities of that unit through a combination of short-term technical assistance and short and long-term training.

#### E. Agricultural Research Fund

In Phase I USAID provided support to plan and implement the Agricultural Research Fund which is designed to award, on a competitive basis small contracts/grants to agricultural scientists outside KARI. This has proven to be a well received effort and it will receive some additional support in Phase II. In addition, limited support will be provided to assist KARI to establish the policies and procedures necessary to become a contract/grant recipient. KARI has demonstrated a capacity to easily absorb this kind of help as evidenced by the successful experience of the ARF.

### III. Sustainability Issues

#### A. General Observations

Many positive developments have taken place during the past three years which gives rise to some degree of optimism that the new KARI, given time and assistance, can truly be a viable, productive and sustainable research organization. It is important to keep in mind that the new KARI is actually only three years old and some would assert that real change did not begin until two years ago when a new Director was appointed. Noteworthy among the positive developments which have occurred are the following:

- o A revamped organizational structure including the appointment of new leadership to key positions;
- o A degree of organizational stability has been achieved especially regarding KARI's administrative home;
- o Strong support from the President of the GOK that KARI will be THE locus of agricultural research in Kenya;
- o A continuous upgrading of the capability of scientific personnel and the development of new schemes of service which will increase the likelihood of recruiting and retaining quality staff;
- o An enhanced administrative systems capability at KARI Headquarters;

- o A strong commitment among the donor community to coordinate efforts and avoid duplication;
- o A gradual and continuous upgrading of physical facilities and research equipment.

While the above clearly denotes progress towards institutional sustainability, there are several areas which are a cause of some concern. Among these are the following:

- o Can KARI, over the long term provide the incentives to recruit and retain a high quality staff--scientific, administrative and support personnel?
- o Can KARI development and implement a resource allocation system which will provide scientists with the authority and responsibility to operate their programs within an overall resource allocation framework?
- o Can KARI devise a long-term system to insure institutional renewal in the form of a continuous program of training and updating its personnel?

Although the above problems are serious and merit attention, they pale next to the financial issues which are at the heart of nearly any discussion about KARI's long term viability. Stated in starkest simplicity, a viable research organization must have a predictable and stable source of funds to allow it to make long range plans for the kind of projects which typify a quality agricultural research program. In many respects the amount of funding is less important than the predictability and stability of funding. Over the long term, one can adjust the size of a research organization to fit within a given resource base but only if that base is relatively stable. While donors can play a role in helping an organization like KARI to develop, in many respects agricultural research is much too important to be left to the discretion of donors. Typically, their interests lack the long-term perspective essential for an organization like KARI. In an ideal world, donor contributions to KARI would help support work at the margins with GOK financing providing the CORE long term support necessary for true institutional sustainability.

Unfortunately, this is not what is currently happening. Tables 1 and 2 attempt to summarize certain historical trends and published future projections regarding KARI's budget and expenditure patterns. A brief discussion of this data is instructive.

At the outset it should be stressed that the data in Tables 1 and 2 should be used with some caution. Overall conclusions about trends can be safely drawn but specific numbers are subject to considerable debate, especially those prior to 1988/89 when Price-

Waterhouse began working with KARI on a project to computerize KARI's accounting system.

Like many organization, KARI receives both a recurrent and a development budget from the GOK. As might be expected, the recurrent budget is heavily loaded with salaries (projected to be 82% in 1990/91, Table 2).

An examination of Table 1 reveals several things. First, for the recurrent budget, there is a substantial variation in the amount of funds KARI expects to receive (published estimates), the amount actually received and what is spent. The difference in receipts vs. expenditures for 1989/90 is particularly worrisome as it would seem that a significant portion of the development budget was actually used to cover recurrent costs.

Second, and considering the above, it would seem as if donors are actually funding nearly the entire development budget. The jump in receipts from 1988/89 to 1989/90 was probably due in large part to KARI and USAID having some success in liberating PL480 counterpart funds from the Ministry of Finance/Treasury. These funds constituted the vast bulk of research operating funds KARI had available during 1989/90. However, they did not become available until very late in the year and in several instances experimental data were lost because they didn't arrive in time. Resolving these problems must continue to be a major emphasis during Phase II. Specifically, action is needed to in the following areas:

- o If counterpart funding is to be employed by USAID to support the commodity research targeted for attention in Phase II, then the GOK must commit itself to release those funds promptly at the start of each fiscal year and permit unspent funds to be carried forward from one FY to the next. Releasing funds for research nine months into the year does nothing for experiments which had to be harvested six months earlier!
- o KARI must take steps to bring its recurrent expenditures more in line with receipts and shift the ratio of salary-nonsalary expenses away from salaries. The ratios employed in the forward budgets for 1991/92 onward are good targets, but won't be achieved without considerable pain.
- o The GOK and KARI must find a way to enhance and stabilize KARI's development budget and reduce the dependence of that budget on foreign donors. A long term effort will be required here but a goal for the next decade might be to set the GOK/KARI contribution to this budget at 40% of the recurrent budget. Again, it needs to be emphasized that the timing of the release of funds is nearly as important as the amount of funds released. Given a choice, a research manager would far

prefer to have 70% of his/her allocation on the first day of the fiscal year as contrasted to 90% on the 250th day.

One final point--over the long term KARI will need to have funds for research operational costs and "development," AND be able to access those funds in a timely and predictable manner. Further, research managers and principle investigators must be able to spend against their budgets as needed. Rarely can a scientist afford to wait days, much less weeks or months, to purchase a supply or service to solve a particular problem. Moreover, KARI and the GOK need to create a mechanism whereby KARI can easily access foreign exchange for those supplies, services, spare parts or new equipment items which simply can't be purchased in Kenya. Such funds will also be needed to keep KARI scientists linked with the international agricultural research community. While the variety of goods and services available in Kenya is high compared with much of sub-Saharan Africa, there are still many specialized items which must be purchased abroad. If this problem is not solved, either by commitments from the GOK, creative arrangements with producer groups who benefit from KARI research (e.g. tea, coffee, pyrethrum), by long-term commitments of donors or by some combination of the above, KARI is likely doomed to be forever in a scientific backwater and much too dependent on the changeable interests of donors.

There are some positive signs on the horizon that mechanisms and policies are being put in place which will help address these difficult problems. First, beginning with the 1991/92 fiscal year, KARI will receive a single line item budget from the GOK. This will give the KARI administration both the flexibility and incentive to begin to shift the ratio of personnel:nonpersonnel expenditures. KARI can well afford to have far fewer employees and better support those who are left.

Second, KARI is now allowed to retain all of the income it receives from the sale of products produced by its farms and centers. Table 1 shows some trends in sales income. The KARI administration feels that a considerable expansion here is very feasible. However, this is a two edged sword. On the one hand, sales income liberates KARI from total dependence on the GOK for revenue. But, there is a danger that if centers become perceived as production rather than research units, research productivity will suffer. This is a manageable problem but it will require careful consideration by the KARI leadership.

Finally, the potential for KARI to receive income (perhaps even foreign exchange) from commodity/producer groups seems high. Kenya is blessed with an agricultural sector which produces a number of high value export crops. If KARI's research program can bolster the production of these commodities, it will be in a strong position to ask for support. Coming as it does at the margin, such support might well provide for the much needed operational costs

and perhaps even a portion of KARI's future foreign exchange needs as well.

Considering all of the above, it would seem that KARI, during the next decade, will reach a threshold of sustainability. By that time, it will have, or should have, a capable human capital base and have most of its minimal infrastructure requirements met. If it can also achieve a budgetary situation where 65% of its core operational budget is in salaries and where it can access foreign exchange with the remaining funds, the probability for true long-term sustainability is high. Much has been accomplished during the past five years but some difficult steps remain. If the GOK maintains its commitments, if KARI takes some needed management decisions, and if donors stay "hitched" during the five to ten years this will take, a real success story can very likely be written. However, a less than full commitment by any one of the "partners" will make it difficult to achieve the goal. Institution building is a slow, difficult and time consuming task but there is a good chance that what will emerge from this effort will be an organization which can be for Kenya what EMBRAPA has been for Brazil--an engine and catalyst for development.

## B. Program Elements

### 1. Planning and Management

Since essential no additional inputs from KARI are required, KARI should be able to sustain the systems which have been installed to date and make full use of them as decision making tools. Obviously, this assumes that operational funds can be found to cover maintenance costs.

### 2. Commodity Research Support Program

By the end of Phase II a reasonable complement of scientists will have returned to KARI with advanced degrees. They will provide the nucleus of these programs. The work performed by the programs will be sustainable if the questions of operational funds and access to foreign exchange can be resolved.

### 3. Agricultural Research Fund

The offices created by these programs are fully sustainable and the programs have a high probability of sustainability if KARI can successfully market the concept to potential donors. There is a high probability of this happening because of unique nature of the Kenyan agricultural sector and the importance high value crops occupy within it.

TABLE 1: HISTORICAL ANALYSIS OF KARI BUDGET/EXPENDITURE DATA BY YEAR  
(IN 1000 KENYA POUND UNITS WITH 1 POUND BEING EQUAL TO  
APPROXIMATELY \$1)

		1986/87	1987/88	1988/89	1989/90	1990/91
<u>RECURRENT BUDGET</u>						
PUBLISHED EST.			10,246	10,886	12,169	12,509
ACTUAL RECEIPTS	2,926		3,091	8,728	10,907	
EXPENDITURES	3,420		3,128	8,930	17,305	
PERSONNEL EXPENDITURES				(70%)	(70%)	
NON-PERSONNEL EXPENDITURES				(30%)	(30%)	
<u>DEVELOPMENT BUDGET</u>						
PUBLISHED EST. (FROM GOK)			3,551	3,450	6,109	7,509
PUBLISHED EST. (FROM DONORS)				9,075	17,377	12,441
ACTUAL RECEIPTS	257		978	693	4,585	
EXPENDITURES	362		592	1,602	1,426	
SALES INCOME (ACTUAL)			79	565	865	

TABLE 2: FORWARD BUDGET PROJECTIONS FOR KARI  
(IN 1000 KENYA POUNDS)

		1990/91	1991/92	1992/93	1993/94
<u>FORWARD RECURRENT BUDGET</u>					
PERSONNEL COSTS		10,259(82%)	9,700(69%)	10,100(67%)	10,500(68%)
OPERATING COSTS		2,250(18%)	4,600(31%)	4,900(33%)	5,000(32%)
TOTAL		12,509	14,300	15,000	15,500
<u>FORWARD DEVELOPMENT BUDGET</u>					
TOTAL		24,255	19,814	13,059	16,805
DONOR FINANCED		16,986	12,441		
GOK FINANCED		7,569	7,373		



## Economic Analysis

### I. Background

The economic analysis (Annex G.2) for the Project Paper discussed problems with quantifying the rate of return from institution-building projects such as the Kenyan National Agricultural Research Program (NARP). As was indicated, the approach taken in the Project Paper was to conduct an indicative break-even analysis for the AID financed project as a part of the overall NARP. It was indicated that an ex post facto economic analysis would be conducted once sufficient data had been gathered. One such study has recently been completed. Karanja<sup>1</sup> estimated the rate of return to maize research in Kenya between 1955 and 1988. He found that the marginal rate of return on investment in maize research was 33 to 47 percent and that the average rate of return for the period was 68 percent. (p. 71) The approach taken in this analysis is to review the assumptions made in the Project Paper to ascertain if they are still valid assumptions, and to review existing data which impact on these assumptions.

### II. Potential Sources of Economic Gains

Economic benefits for the project were expected to accrue from sustained achievements in: 1) research planning and management; 2) technology development and adaptation for maize, sorghum and millet; and 3) improved research-extension linkages which were to be initiated by the AID and IBRD financed projects. The sources of benefits included increased agricultural production and improved efficiency/effectiveness of the agricultural research-extension system.

#### A. Increases in Agricultural Productivity

There are several partial sets of crop performance data available but there tend to be discrepancies between sources. This section starts with a review of performance indicators for the coarse grains - maize, sorghum and millet - which were the primary crops considered under Phase 1 of the NARP. These indicators are based on district level crop data reported by the district agricultural offices during a national survey carried out in preparing the 1991 National Water Master Plan. District level crop data, including areas planted, yields, and prices were collected for 1985 to 1989. These were aggregated to form national data and the results are presented in Table 1 and are discussed in the following sections.

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<sup>1</sup>Daniel Karanja, "The Rate of Return to Maize Research in Kenya: 1955-88", un-published Master of Science Thesis, Michigan State University, 1990.

Projections on crop performance indicators to the year 2000 have been prepared by the World Bank. Some of these are also reviewed.

## 1. District Performance Indicators

### a. Area Under Crop

The area under maize has not attained the level envisaged between 1985 and 1989. On average it has fallen short by about 15%. Maize however, is planted in all the districts in the country. There was a decline in area planted between 1986 and 1988 with a slight recovery of 2.4% in 1989. On average maize is planted on 1.4 million hectares.

Between 1985 and 1989 sorghum has occupied between 248,000 ha and 136,000 ha in the 30 - 36 districts where it is grown. It is notable that during the drought of 1984 - 85 there was an increase of 30% on the area planted to sorghum. In good weather years the area planted to sorghum tends to decrease.

Millet occupies the least area among the three coarse grains and was reported grown in only 25 out of Kenya's 40 agricultural districts. After 1987 the area under millet showed increases of 8.5% and 9.6% for the two subsequent years, respectively.

The total area committed to the coarse grains tended to decline from 1.7 m ha in 1985 to 1.65 m ha in 1989. Maize occupied an average of 84.7% of the total area under coarse grains for this period.

### b. Production

1985 was a drought year and the production of maize was low compared to that of subsequent years. After 1987 maize production seems to have attained a positive increase that led to a production level of 3.2 m tons in 1989. This is equivalent to 36 m bags of 90 kg. To sustain self sufficiency in maize at a per capita consumption level of 122 kg and an annual population growth rate of 3.5%, Kenya needs to have a sustained increase in production of 4.7% p.a. (or has to make up production shortfalls with imports). This analysis shows that whereas there are substantial declines in some years (e.g 1986) maize production has attained a general tendency to increase at varying rates. Estimates by CIMMYT place the expected annual growth rate at 1.7% p.a. calculated with the formula for annual percentage compound growth<sup>2</sup>.

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<sup>2</sup> Growth rate calculation by formula for annual percentage compound growth:

$$X_t = X_0 (1 + (g/100))^t$$

Kenya's research effort in maize is concentrated on white maize where hybrids and composites have been developed for a wide range of agro-ecological zones and altitudes. Estimated adoption of hybrid maize has increased from 120 ha in 1963 to over 1 million ha in 1988. This includes both large and small scale producers. It is expected that with the rate of adoption of new varieties, production of maize will continue to increase. The case for continued research activity is strongly supported by this trend.

The Ministry of Agriculture (MOA) statistics show that 175,000 mt of sorghum were produced in the 1985/86 season. After that however, production of sorghum has continued to decline and in 1989 only 135,000 mt were produced. This tallies with the decline in area planted. However, the number of districts in which sorghum was planted increased between 1987 and 1989 from 31 to 36.

On average, the production of millet has remained at about 60,000 mt between 1985 and 1989. Discussion on sorghum and millet production between 1974/76 and 1988 (Rutto, J.K, 1989) states that there is a positive trend in the production of sorghum and millet in the marginal areas. It is concluded that given positive support in research and development as it relates to crop improvement, seed availability, appropriate production packages, processing and utilization, the prospects for these crops are good. Improvement of the marketing channels and pricing would make these crops more attractive enterprises to the grower. Finally, sorghum and millet marketing has been 'decontrolled'. This promises to increase demand and perhaps lead to growth in exports.

### c. Yield

The yield for maize is improving steadily. From the level of 1.67 mt/ha during the drought of 1985, yields have risen steadily to 2.26 mt/ha in 1989 which is equivalent to 25 bags/ha. This represents slightly over a third of what is realized by the large scale producer whose present yield is about 6 mt/ha. The data did not specify small or large holder producers but the districts with predominantly large holder producers showed markedly higher yields.

The yields for sorghum and millet have remained below 1 mt/ha with millet yielding slightly lower than sorghum. The differential in their yields is a sustained 5%. Whereas sorghum has exhibited an upward yield trend from 1986 to 1989, millet has exhibited erratic oscillation with yields falling to a low 0.61 mt/ha in 1987, recovering to 0.7 mt/ha in 1988 before falling again by 12.2% to 0.65 mt/ha.

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where:  $X_t$  = 3 years moving average of data for ending period  
 $X_0$  = 3 years moving average of data for base period  
 $t$  = number of years from the mid-point of base period to that of ending period  
 $g$  = 3 year moving average annual % growth rate.

TABLE 1: NATIONAL PRODUCTION STATISTICS FOR MAIZE, SORGHUM AND MILLET

A: AREA UNDER CROP, (Ha x 1000)						
Year	1985	1986	1987	1988	1989	
MAIZE	n	40	40	40	40	40
		1,426.9	1,420.6	1,366.2	1,392.0	1,424.8
	% CHANGE	-0.4	-3.8	-1.9	2.4	
SORGHUM	n	30	32	31	36	36
		190.6	248.3	136.1	142.0	136.4
	% CHANGE	30.3	-45.2	4.3	-3.9	
MILLET	n	25	25	25	25	25
		84.5	80.5	77.7	84.3	92.4
	% CHANGE	-4.7	-3.5	8.5	9.6	
TOTAL AREA		1,702.0	1,749.4	1,580.0	1,618.3	1,653.6
n = number of districts growing the crop						
B: PRODUCTION, (t x 1000)						
MAIZE		2,383.0	2,902.8	2,466.4	3,142.5	3,225.2
	% CHANGE	21.8	-15.0	27.4	2.6	
SORGHUM		159.6	175.3	112.1	117.8	135.1
	% CHANGE	9.8	-36.0	5.1	14.7	
MILLET		64.9	56.8	47.6	62.5	59.7
	% CHANGE	-12.5	-16.2	31.3	4.5	
TOTAL PRODUCTION		2,607.5	3,134.9	2,626.1	3,322.8	3,420.0
C: YIELD, (t/ha)						
MAIZE		1.67	2.04	1.80	2.25	2.26
	% CHANGE	22.0	-11.8	25.0	0.4	
SORGHUM		0.84	0.71	0.82	0.83	0.99
	% CHANGE	-15.5	15.5	1.2	19.3	
MILLET		0.77	0.71	0.61	0.74	0.65
	% CHANGE	-7.8	-14.1	21.3	-12.2	
D: TOTAL VALUE *, (KSh. Million)						
MAIZE		5,846.41	6,731.18	6,081.58	7,930.82	9,147.24
	% CHANGE	15.13	-9.65	30.41	15.34	
SORGHUM		397.56	302.01	223.46	276.47	327.78
	% CHANGE	-24.03	26.01	23.72	18.56	
MILLET		195.57	172.03	133.38	111.45	185.42
	% CHANGE	-12.05	-22.47	-16.44	66.37	
TOTAL		6,439.54	7,205.22	6,438.42	8,318.74	9,660.44

Notes: \* This is the Total Value Product which is the product of the yield and the market price. Note that the official price given by the National Cereals and Produce Board (NCPB) has not been applied. Instead it has been assumed that a future liberalized grain market will continue to offer attractive prices at the farm gate.

TABLE 1: NATIONAL PRODUCTION STATISTICS FOR MAIZE, SORGHUM AND MILLET (CONTINUED)

E: GROSS RETURNS, (KSh/ha)						
Year	1985	1986	1987	1988	1989	
MAIZE	4,096	4,731	4,439	5,679	6,409	
% CHANGE	15.64	-6.05	27.99	12.68		
SORGHUM	2,092	1,223	1,634	1,948	2,402	
% CHANGE	-41.69	35.00	18.58	23.42		
MILLET	2,315	2,137	1,716	1,322	2,007	
% CHANGE	-7.69	-19.70	-22.96	34.13		
F: AVERAGE MARKET PRICE, (KSh/t)						
Year	1985	1986	1987	1988	1989	
MAIZE	2,453	2,319	2,466	2,524	2,836	
% CHANGE	-5.46	6.08	2.35	12.36		
SORGHUM	2,491	1,723	1,993	2,347	2,426	
% CHANGE	-30.83	15.67	17.76	3.36		
MILLET	3,014	3,029	2,802	1,783	3,106	
% CHANGE	0.50	-7.50	-36.37	42.59		
Average Price (AP) = TVP/Y where: TVP = Total Value Product for each district, Y = National Yield						
Source: Ministry of Agriculture						

#### d. Total Value

In calculating the total value for each commodity the market price for each district was used and the district values summed. This method assumed that the market price and not the NCPB official producer price was a better indicator of value at the farm gate. Rural market and NCPB prices for 1985 - 89 compare as shown on Table 2.

Table 2: NCPB and Rural Market Maize Prices 1985 - 89, (KSh/kg)

	1985	1986	1987	1988	1989
NCPB	1.76	2.09	2.09	2.21	2.31
Rural Market	2.45	2.32	2.47	2.52	2.84

Sources: 1. NCPB  
2. Ministry of Agriculture

Following recommendations made in several studies carried out on the activities of the National Cereals and Produce Board, the maize market is set for gradual liberalization. Presently consignments of 44 bags of maize can be moved across district boundaries without a movement permit, a fourfold improvement on the earlier 10 bags.

As a result, an estimated 30 - 40% of the NCPB trade will pass to the free market trader who already is offering attractive prices at the farm gate.

Between 1986 and 1989 it was estimated that the total marketed small scale production of maize through the NCPB was between 78 and 86%. However, more conservative estimates put the proportion of total maize production sold through the NCPB at 50%. Considering that a liberalized market will now attract more maize, it can be assumed that the rural market price is a more appropriate one to use in this economic analysis.

The contribution of maize to the national economy has risen in the five years under discussion from KShs. 5,846 million to KShs. 9,147 million. There is an upward trend of over 10% per annum. (Note that no deflators have been used to even the effects of inflation etc). Over those years maize has continued to contribute over 90% of the total value of coarse grains with sorghum a far second and millet contributing a half as much as sorghum.

At an average of KShs. 300 m over the five year period the value of sorghum seems to have stagnated although it recovered from two consecutive depressions of 24.03% and 26.01% between 1985 and 1987. The value of the millet produced nationally has ranged between KShs 195.57 m to KShs 111.45 m. This has been in part due to variations in production and changes in market prices.

#### e. Market Prices

Maize forms the staple food for Kenya's rural and urban population. For this reason it has for a long time been Government policy to maintain high production, and to participate in its marketing including storage and distribution. Currently a trade liberalization process is underway which will have a significant effect on the improved relative profitability of maize and on market prices. Presently it is reported that lorry traders are buying maize at the farm gate in western Kenya at prices ranging between KShs. 2.45 and KShs. 3.00 per kg to sell to the deficit districts. As maize is harvested throughout the year, this trading activity will continue with the traders moving from one harvesting district to the next. The market prices used in this analysis are prior to liberalization, when it was possible to legally move only 10 bags of maize across district boundaries. These prices have been shown to be generally higher than the NCPB producer prices (Table 2).

Other than for a 30.83% decline in 1985, the price of sorghum has been increasing every year. This is a confirmation that sorghum has begun to be put to uses other than the traditional porridge and opaque beer ones. For example, it has been found that sorghum can also be utilized in lager beers. It has been estimated that the potential for the utilization of sorghum and millet in 'uji' (porridge), opaque and lager beers stands at 48,000 mt, 30,000 mt

and 14,000 mt annually, respectively. The declining prices of millet through 1989 have been reversed with higher prices reported in selected producer areas in 1991 reflecting the potential for expansion of millet production.

#### f. Gross Returns

Maize has the highest returns per ha compared to sorghum and millet. This return is increasing in response to the increase in price and yield. The return, at KShs 4,500 on average is double the return for sorghum or millet. This could be explained by the fact that whereas maize is grown under strict commercial cultural practices, often as a monoculture or mixed only with beans, sorghum and millet do not receive such careful attention. Sorghum is often planted in haphazard rows along plot boundaries while millet may be broadcast in small plots where the soil is lean.

### 2. World Bank Sector Growth Projections

As was indicated in the Project Paper, maize is Kenya's major food crop. While maize production has been increasing it has been doing so more slowly than the population growth rate, and well below the rate the GOK would like to see. The World Bank<sup>3</sup> reports that increases in area planted produced 80 percent of the 3.8% per year increase in total maize production over the 1963-87 period, while area expansion accounted for only 20 percent of the 2.3% per year increase in the 1980-87 period. Thus in recent years yield increases have become the major source of growth in maize production. The World Bank projects an increase in maize area from 15.2% of agricultural land in 1986 to 18.6% in 2000. In the same period the value of maize production will increase from slightly under 5 billion Kenya shillings to slightly over 9 billion (p.21).

Sorghum and millet are important food crops particularly in the Arid and Semi-Arid Lands (ASALs). The World Bank reports a growth rate of nearly 4% per year during the 1980-87 period for sorghum, with most of that growth occurring in the ASALs. In these areas there has been a growth rate of 6.1% per year influenced by a 15% per year expansion in area coupled with a negative growth in yields. Improved sorghum varieties have not been adopted due to taste problems and greater susceptibility to insect and bird damage than is found in local varieties. Sorghum accounted for 2.5 percent of agricultural land and 1.7 percent of agricultural GDP in 1986. The area planted is projected to increase to 2.8 percent in 2000 while percent of GDP is expected to decline to 1.3 percent. (p. 23)

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<sup>3</sup>World Bank, Kenya' Agricultural Growth Prospects and Strategy Options, 1990.

As was pointed out in the Project Paper Economic Analysis, the population growth and limited availability of additional high potential lands, makes it imperative that the existing yield gap in basic grains production between small holder farmers and more progressive farmers be closed. The World Bank reports this difference to be 1.0 versus 2.5 tons per hectare for maize and 0.5 versus 0.9 for sorghum. Potential yields obtained on experiment stations are considerably higher, up to 10.7 ton/ha at Kitale.

A new commodity area is proposed for Phase 2 of the NARP, this is the area of horticulture. Because of its wide range of agro-climatic conditions, Kenya is blessed with a diversity of horticultural crops amounting to 40 different commodities. The World Bank reports that about 6.6 percent of agricultural land is used for horticultural food crops for domestic markets. This makes horticulture the third most important crop after maize and beans. Approximately 95 percent of production is consumed in the domestic market and accounting for 85 percent of the value of production. The remainder is exported, making horticulture one of the most important foreign exchange earners. Horticultural production is estimated to have grown between 8 and 10 percent per year during 1980-87 with area increases accounting for 60 percent of the growth. World Bank projections for 2000 indicate that horticulture will occupy 8 percent of the agricultural land and its value will increase from 10.4 percent of GDP (in 1986) to 16.5 percent, giving it the highest value of all crops. (p. 27)

The Project Paper Economic Analysis suggests that three fundamental problems needed to be addressed in maize research. These were: 1) late maturity genetic bias, 2) large holder bias, and 3) lack of a coordinated program across stations which was capable of establishing research priorities and serving as a reservoir for knowledge gained. During the first part of Phase 1 steps have been taken to address these constraints.

In regards to the late maturity genetic bias, there is work being done on early maturing varieties which has every likelihood of success during the ten year life of the project. Two such varieties were released in 1989, one with an 80-110 maturity period, the other with a 100-130 day period, well below the 180-270 day maturation periods of the majority of the improved varieties. The approach KARI is taking to the large holder bias is to implement an adaptive research program based on the farming systems approach. This program, when fully developed, should substantially increase the number of adapted technologies available for dissemination to small-holders over the life of the project. Finally, a system for coordinating research within commodities has been established and is being implemented.

The World Bank in its Growth Prospects document indicates that the current major constraint in maize production is not the lack of high yielding varieties (although these will be important in the future) but the need for extension of improved agronomic practices which are adapted to local conditions and research to overcome



striga, smut and streak diseases. For sorghum the Bank identifies a need for high yielding varieties with increased pest resistance and palatability, coupled with research to overcome striga, smut and streak. In the horticulture area there is a need for high yielding and quick maturing varieties along with advise on crop management. This latter area will involve researchers in training extension staff in production management techniques and husbandry practices that meet market quality standards.

#### B. Savings from Improved Institutional Efficiencies

Following the reorganization of KARI there continue to be major financial problems. As is reflected in the Institutional Analysis, KARI has a high proportion of funds in personnel costs with very little for actual operation and maintenance. In addition funds which were budgeted never materialized, and thus a common situation is that projects can not be completed due to lack of inputs, travel funds, etc. The Project Paper Economic Analysis identified three areas of potential savings which could be realized by the reorganization of KARI. These were: 1) the reduction in research stations from 43 to 24; 2) the prioritization of GOK supported research with the termination of research activities which are either of low national priority or in which the GOK does not have a comparative advantage; and 3) the integration of commodity factor programs across stations.

The reduction in the number of stations has taken place, however with the reorganization has come considerable personnel transfer and budget adjusting between Ministries and so it is difficult to determine how much actual savings may have been achieved by the reduction in the number of stations. There have been and continue to be planning and prioritization exercises which have provided more structure to the KARI administrative system. KARI is in the process of coming to grips with the management of its research activities in a way that management decisions based on reliable information will soon be possible. It is anticipated that the management systems put into place during the first phase of the NARP will have long range impacts on KARI. The integration of programs across stations is also in its infancy and the system is not yet fully operational. Again when the current structures are fully implemented there should be increased control of programs, and hence the capability of making rational management decisions regarding projects to be continued, modified or eliminated.

The implementation of payroll, accounting and fixed assets tracking systems during Phase 1 have not only provided more information on which to make management decisions but have either led to present cost savings or provided the system which can produce cost savings in the future.

### III. Indicative Break-Even Analysis

The model presented for the entire project included a break-even analysis based on the increased production of maize alone and indicated that the AID and GOK investment would be paid by the year 2007. This model included the following assumptions:

- o a technology generation process which improves the yield of adopted acreage by 2.75% in the initial years increasing progressively to 3.5% in 2002;
- o an adoption rate which increases from 0.8% in 1992 to 25% in 2007; and
- o incremental cost savings to KARI as a result of improved planning and management systems beginning at 0.5% of the cost of the KARI proposed program in 1990 and increasing to 5% in 1999.

#### A. Estimation of Costs

There were several cost areas included in the model. These areas and comments on their estimates are:

- o Investment of AID. Two factors reduced this cost. First, the project for the first phase was funded at a slightly lower level than is reflected in the break even analysis, and second, the project did not start until approximately 18 months after the start-up date used in the break-even analysis. A re-run of the cost-benefit analysis reflecting the currently anticipated AID investments is presented in Table 3. With a decrease in costs and unchanged benefits, the cost-benefit ratio is now greater than one, indicating that less benefits will need to be realized to obtain a break-even situation.
- o Incremental cost to the GOK of implementing the project. Assumptions made in determining the cost estimates for the GOK are not discussed in the economic analysis, thus it is difficult to determine if the estimates are still reasonable. In terms of the break-even analysis there is a shifting in the timing of the cost, at a minimum.

TABLE 3  
INDICATIVE BREAK-EVEN ANALYSIS OF AID FINANCED  
NATIONAL AGRICULTURAL RESEARCH PROJECT  
(000 US\$)

Year	INCREMENTAL PROJECT COSTS				INCREMENTAL PROJECT BENEFITS		
	AID	GOK	ON-FARM	TOTAL	COST SAVINGS	INC. PRODUCTION	TOTAL
1987	0.0	740.4	0.0	740.4	0.0	0.0	0.0
1988	3,800.0*	681.9	0.0	4,481.9	0.0	0.0	0.0
1989	3,800.0*	859.2	0.0	4,659.2	0.0	0.0	0.0
1990	3,800.0*	934.9	0.0	4,734.9	102.3	0.0	102.3
1991	3,800.0*	1,003.4	0.0	4,803.4	192.6	0.0	192.6
1992	4,975.0	1,064.9	62.3	6,102.2	289.9	207.6	497.4
1993	5,595.0	1,091.3	140.4	6,826.7	388.2	467.9	856.1
1994	4,220.0	1,315.5	197.8	5,733.3	483.4	659.4	1,142.8
1995	3,510.0	960.3	321.7	4,792.0	589.8	1,072.5	1,662.3
1996	1,950.0	899.5	455.6	3,305.1	690.6	1,518.6	2,209.2
1997	0.0	1,234.2	593.1	1,827.3	790.0	1,976.9	2,766.9
1998	0.0	1,234.2	852.8	2,087.0	888.8	2,842.5	3,731.3
1999	0.0	1,564.2	1,119.6	2,683.8	987.5	3,731.9	4,719.4
2000	0.0	1,234.2	1,378.8	2,613.0	987.5	4,596.1	5,583.6
2001	0.0	1,564.2	1,644.1	3,208.3	987.5	5,480.4	6,467.9
2002	0.0	1,234.2	1,902.6	3,136.8	987.5	6,342.2	7,329.7
2003	0.0	1,234.2	2,143.6	3,377.8	987.5	7,145.5	8,133.0
2004	0.0	1,234.2	2,381.7	3,615.9	987.5	7,939.1	8,926.6
2005	0.0	1,234.2	2,586.4	3,820.6	987.5	8,621.3	9,608.8
2006	0.0	1,234.2	2,777.2	4,011.3	987.5	9,257.2	10,244.7
2007	0.0	1,234.2	2,963.5	4,197.7	987.5	9,878.5	10,866.0

PRESENT VALUE AT 12%

PRESENT VALUE OF INCREMENTAL COSTS: 80,758.8

PRESENT VALUE OF INCREMENTAL BENEFITS: 85,040.5

BENEFIT/COST RATIO: 1.053

\* ACTUAL COSTS TO AID FOR PHASE I WERE NOT AVAILABLE BY YEAR SO THE TOTAL OF APPROXIMATELY \$15.2 MILLION WAS APPORTIONED BETWEEN THE FOUR YEARS.

- o Incremental cost of strengthening research-extension linkages. All indications are that minimal investment has been made in this area. The cost of improving this linkage may be reduced in the short run through funding by IBRD to the National Extension Project II. However, in the long-run KARI and the various extension organizations will need to develop improved linkages, for which the committee structure is currently being institutionalized, and means for funding joint activities such as training and on-farm research/demonstrations will need to be found.
- o Additional costs to the farmer of adopting improved technologies. As was indicated in the Economic Analysis, data on these costs have yet to be developed. In the light of this the assumption of that incremental on-farm costs will not

exceed 30 percent of the incremental gross revenues is probably valid.

#### B. Estimation of Benefits

The break-even analysis was based on the assumption that all of the project costs to both AID and KARI would be more than compensated for by the increase in maize production and savings resulting from operating costs reductions and improved institutional efficiencies. In the light of proposed project expansion into the horticultural area this assumption is indeed very conservative.

The estimation of benefits due to increased maize production is based on the following assumptions:

- o The increase is not expected to occur until five years after project start-up. This is still a reasonable assumption.
- o Yield improvements are assumed to be 2.75% per year in the initial years progressively increasing to 3.5% in year 15. There are no apparent reasons why this assumption should not hold.
- o Adoption rates will be 0.8% in year 5, 5% in year 10, 15% in year 15, and 25% in year 20. While these adoption rates may be realistic it will require more adaptive research and a much great linking with extension for research to contribute to assuring this level of adoption. The World Bank in its NEP II<sup>4</sup> project proposal estimated adoption rates for adoption of two new maize husbandry practices to be five percent the first year and 65 or 70 percent by year five. Thus an increase in adoption to 25 percent by year 20 of the NARP seems to be conservative.
- o The proposed yield increase and adoption rate indicate an overall increase in production of 35.5% (from 1.373 MT/Ha in 1987 to 1.861 MT/Ha in 2007). Again this appears to be an achievable increase. The World Bank in NEP II project a yield increase of 26 percent for a proposal to increase maize populations and a 50 percent increase for farmers who practice early planting. Table 4 provides a comparison of projected yields and yields reported at the district level. This data seems to indicate that there is a higher yield level for maize than was used in the planning document<sup>5</sup>.

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<sup>4</sup>World Bank, Staff Appraisal Report, Kenya, Second National Agricultural Extension Project, Nov. 1990.

<sup>5</sup>No standard series of agricultural data is obtainable in the country. This data is an aggregate of district data collected by ReMa Associates from district officials.

TABLE 4: COMPARISON BETWEEN PROJECT PAPER  
PROJECTED YIELDS AND OBSERVATIONS FOR MAIZE, (MT/HA)

Year	1985	1986	1987	1988	1989
PP Projection (a)	-	-	1.37	1.39	1.40
Observed (b)	1.67	2.04	1.80	2.25	2.26
Difference (b)-(a)	-	-	0.43	0.86	0.86

- o The parity price of maize is assumed to average \$180/MT for the life of the project.

Savings resulting from operating costs reductions and improved institutional efficiencies are assumed to begin in year 4 of the project at 0.5% of the KARI base budget and increase to 5.0% by year 12 of the project. These appear to be obtainable reductions. Improvements in the management system initiated by KARI have already provided benefits in the following areas:

- o Personal/payroll systems allow for monitoring staff to insure that personnel are paid at the appropriate rate and has allowed the tracing and recovery of salary advances.
- o Accounting improvements have eliminated duplicate payments to creditors, improved control of impress funds, and provided the ability to manage cash more effectively, thus reducing the likelihood of having credit cut off.
- o A fixed assets management system reduces the possibility of purchasing equipment that is already available, thus allowing capital expenditures to be channeled for needed equipment. In addition expensive items can be insured and there is an ability to track losses.

The 12% discount rate used in the analysis is still applicable.

#### IV. Feasibility of Achieving the Projected Economic Benefits.

Initial estimates of economic benefits were conservative in nature. These benefits could be increased by adding potential benefits for increased production of sorghum/millet and horticultural to the equation. However, to maintain the conservative nature of the analysis, only maize will be considered.

##### A. Maize Production Gains

The attainment of the estimated adoption rate of 2% a year is certainly potentially feasible but whether it can be obtained in fact may depend on two issues. First, there is a need for KARI to produce more adapted research which is specific for agro-ecological and socio-economic systems. Second, improved linkages must be established between KARI and the extension services so that a two way flow of information between researchers and farmers can be obtained to assure that technologies being presented to farmers are applicable to their situations. Without these two conditions there

will certainly be growth, and it may well reach the 2% per year level, but it will not maximize the use of research resources.

#### B. Estimated Cost Savings

While some cost savings have occurred they have been in the mechanics of operating the management system and major savings due to actual management decisions have still to be documented. There is no reason to believe that the anticipated cost savings are not, or will not, occur.

#### V. Cost-Effectiveness Analysis

A number of the steps were outlined in Phase 1 to increase the cost effectiveness of KARI's operation. The management systems are installed and functioning, and training in how to use the output generated by these systems is progressing. Planning and prioritization activities have been, and are, going on. Linkages with universities and international research centers have been established or strengthened.

Problems remain in several areas which will need to be addressed if the agricultural research program is going to show improved cost-effectiveness. KARI management is faced by several budget constraints. The major constraint is that a very high percentage of funds go toward salaries, leaving little for operational expenses. This problem is compounded when budgeted funds are not released by government -- an all too frequent occurrence. The financial situation often means that staff are not employed in a cost-effective manner as they lack the inputs to carry out research programs. This is particularly a problem for adaptive research because the critical on-farm link can not be established and maintained without reliable transportation.

#### VI. Other Less Easily Quantified Benefits

Several less easily quantified benefits were discussed in the original Economic Analysis. This discussion remains valid. The inclusion of horticultural research in the project will particularly support such areas as increased demand for labor, as horticultural crops are generally more labor intensive than maize, improved nutrition, and increased foreign exchange. Although this analysis values production with open market prices, PP benefit calculations employed an import parity maize price of \$180 over the LOP. The updated benefit stream underestimates foreign exchange savings that would accrue from reduced maize imports. Currently, the import parity price for white maize, delivered Nairobi, is approximately \$220/metric ton. Finally, as millet and sorghum have been descheduled (i.e. NCPB is no longer the sole legal market participant) export transaction costs will fall. This will result in increased millet and sorghum exports. Aside from the foreign exchange earnings, millet and sorghum exports will increase domestic producer prices and incentives for increased production in areas too dry for other crops.

## SOCIAL SOUNDNESS ANALYSIS UPDATE

### I. Background

This social soundness analysis updates the analysis in the original Project Paper with special emphasis on horticulture and farming systems research, two new areas of project activities planned under Phase II.

There are few significant changes or new developments to the original analysis of population and demographic features, land distribution and tenure, household structure and production factors, food consumption and nutritional patterns and the hybrid maize experience in Kenya. Providing employment for a growing labor force, managing increasing urbanization and feeding a growing population continue to be serious problems for economic managers.

### II. Horticultural Research

#### A. The Horticultural Crop Industry

The recent emphasis placed on horticulture is part of the GOK's strategy for economic management and renewed growth. The stated objectives of this strategy are to promote exports hence increase foreign exchange earnings; generate cash for the household; promote employment and reduce the levels of poverty and malnutrition. The main concentration of horticultural crops has been Central Province, some parts of Eastern and Rift Valley Provinces. They are mainly grown by small holders on an average of 1.0 ha., although cut flowers are planted on a large scale. The following are the socio-economic analyses of factors hinging upon transfer of technology to the farmers.

In horticulture, the link between research and extension has not been very successful for a number of reasons:

- o Research in horticulture has been relatively dormant. As a result there has been inadequate training of farmers regarding new production skills and crop husbandry for maximum utilization of inputs and production. This is why farmers, exporters and extension staff have had to rely on poor quality and expensive planting materials obtained from private sources. Poor quality planting materials, coupled with sub-standard crop husbandry using outdated technology and a lack of crop protection consequently leads to poor harvests. This is bound to discourage most farmers.

- o Although horticultural crops are supposed to be of relatively high value and promise a high rate of return, the lack of an effective extension service leads farmers to continue growing varieties of e.g. flowers that are outdated and therefore have low value.
- o Although use of fertilizers and pesticides have the potential of increasing yields dramatically, few small scale farmers are able to afford to maintain the required quantities of either. This forces them to limit their activities to levels they can personally afford or to what they can obtain through short-term credit. This leads to low yields from their farms and beats the purpose of technology transfer.
- o Although horticultural produce have high value, the high perishability of the produce exacerbated by poor handling and inadequate facilities leads to heavy losses which most farmers cannot afford.
- o Losses in one crop always tends to make farmers adopt many crops not so much to maximise on profit, but to spread risks. This makes the idea of technology adoption and transfer a secondary issue.
- o The wastage incurred through the perishability of horticultural food crops denies the household not only the needed cash but also the needed protein since spoilage takes place en route the destination. With the spoilage, the levels of poverty and malnutrition within the household are not quite alleviated.
- o The labour intensity of horticultural crops exerts a considerable amount of pressure on the already burdened members of the household, who are primarily women and children. One frequently encounters comments such as the production costs are insignificant because "they rely upon family labor". This suggests a complete disregard of the economic as well as social costs of family labour on the basis of the fact that they are difficult if not impossible to quantify. Yet in terms of technology transfer it is probably the factor that tips the balance away from purely minimising on losses to maximising on profits.
- o Accessibility to technology is also constrained by a lack of co-ordination between ministries and other agencies involved in horticulture. This leads to unco-ordinated prioritization of the promotional technological activities that should be implemented.



## B. Adoption of Horticultural Recommendations

Horticultural recommendations suggested to the farmers do not seem to be adopted easily. The problem of extension is exacerbated by the fact that 50% of horticultural produce consist of cut flowers which are grown mainly by a few large scale farmers. The technology used is in-house and restricted. The rest of the farmers depend upon extension organized by the Ministry of Agriculture where there are no organized field days - for cut flowers. Small scale farmers therefore greatly depend on borrowed technology as well as their own initiatives in experimentation with different sub-standard seed varieties. The problems fall into two categories.

- o The lack of research in horticulture in general which inevitably affects farmers' actions; and
- o A persistent lack of understanding of farmers' perceptions and needs. Other weakness identified in agricultural extension similarly apply to horticulture.

Along with weaknesses associated with research and extension services, there are also financial difficulties that can only be addressed through subsidies of seeds and the necessary infrastructure such as marketing and transportation. These issues are best tackled by the GOK directly or through HCDA and commercial banks. The recommended approach is to make horticultural research, extension and productivity national concerns, rather than concerns of individual farmers.

Horticultural research and extension could also benefit with little more attention paid to few crops rather than a proliferation of many poorly researched varieties of crops and flowers grown all over the country with little or no supervision.

## C. Beneficiaries

Horticultural research has a potential to contribute immensely to the economic development of the nation and to the household economy. Crops in this category have three special characteristics that will enable Kenya to overcome some development challenges in years to come.

First horticultural crops are of relatively high value and are therefore valuable to an economy faced with a shortage of arable land. Second, although most horticultural crops are labor intensive they have relatively high returns as compared to many other crops. Third, most horticultural crops are suited to small holder farming in a wide range of agro-ecological zones which is an important element to household food security, income distribution and alleviation of poverty (Ministry of Agriculture, 1991).

According to the assessment by the Ministry, the sector employs about 75% of the total labor force, contributes about 30% to Gross Domestic Product, and provides nearly all national food requirements and raw materials for the industrial sector. The export volume has increased from just over 15,000 MT in mid 1960's to approximately 50,000 MT in 1989 which earned the country an estimated Ksh.2.3 billion representing 12% to 15% of the total domestic exports of the country. See table below:

Year	Quantity (tons)		Value (Million K.sh.)		
	Fresh	Processed	Fresh	Processed	Total
1985	30,000	54,465	469	590	1059
1986	36,210	74,209	620	703	1323
1987	36,550	100,319	900	633	1533
1988	59,120	92,344	1,328	546	1874
1989	48,665	77,175	1,400	940	2340

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Horticultural production for domestic consumption alone is estimated at 3 million tonnes annually, grown in approximately 90,000 hectares and providing about 100,000 full-time on-farm jobs.

If the sector continues to produce high quality products and if the bottlenecks beseting it are overcome, the Kenyan horticultural market will also benefit from an increased volume of business associated with the increasing levels of outputs and productivity.

Research benefits that are largely intangible apply equally to horticulture as to agriculture.

### III. Farming Systems Research

#### A. Adoption of Agricultural Recommendations

Beyond the credible levels of adoption of hybrid maize seeds for the long rains in high potential areas and of Katumani composite maize seeds in some of the dryland areas in Eastern Kenya, the improved cultural practice recommendations put forward by extension service this past decade tend to be repeated year after year and largely not adopted by farmers. One reason for this has been that until recently there have been relatively few formal linkages between the farmer, extension and research services to provide farmers with appropriate, useful improved technologies. The forging of research and extensions linkages under the Training & Visit (T & V) system has been occurring to provide extension with technical messages to pass to farmers. However, almost nothing is done to enable the extension agent to relate the message to the farmer's conditions or to provide a flow of information from

farmers to guide research priorities. The problems can be summarized as follows:

- o agricultural researchers have little practical knowledge about farmers' strategies and conditions which relate directly to the applicability of their research work.
- o T & V and agricultural research are based on geographic area, not matching recommendations with target group characteristics, and
- o agricultural researchers and extension agents are either not well trained or do not have a systems perspective and therefore are often unaware of the full economic implications of the recommendations they advocate (see Anandajayasekeram)

#### B. On-Farm Research Experience

The agricultural problems listed above are being addressed in the work of some MOALD research and extension staff with assistance from CIMMYT. Since 1984 CIMMYT has been working periodically with approximately 50 staff members, providing practical training in a farming system approach. While the experience to date has been positive it also reveals the following weaknesses in the on-farm work:

- o the on-farm trials are often carried out with little participation by the farmer; the research team with hired casual labour perform most of the work.
- o the kinds of trials conducted tend to be based on familiar recommendations, especially use of chemical fertilizers, which ignore implications from the informal survey findings, and
- o results are measured only in terms of yields per land unit.

These weaknesses reveal two basic problems: a) difficulty in acceptance of farmers participating in activities labelled as part of research and b) difficulty in considering a variety of options to address an identified problem (e.g crop rotation as an option to increase soil fertility). Other institutional-related problems have also become evident: a) although economists have been placed at research stations to do socioeconomic work, they tend to leave for other jobs, and b) a sufficient amount of funds and adequate transport must be made available to facilitate researchers and extension agents involvement in on-farm work.

Furthermore, the attitudes of research station personnel are often biased against working with farmers. When administrators of research stations were not supportive of the farming system work, staff were unable to devote the requisite time to doing this work.

Even after two years of exposure, some team members were unconvinced that on-farm work related to the nature or purpose of their job. Often those with lower educational qualifications more readily understand the value of on-farm work. The style of scientific work occurring on research stations, the standards which divorce research from the reality of Kenyan farmer conditions, and expectations of comfortable work conditions can be traced to the formal education that scientists have received, in and outside of Kenya. Their education has directly or indirectly provided these job expectations, associated with a style of the scientific and largely theoretical mode of thought and behaviour. It is difficult to change them and there are no recognized rewards for those who do change.

On farm research experience for horticulture is insignificant. Better management of horticultural crops are not being achieved by the majority of small holders due to insufficient tailoring of research results and shortfalls in the dissemination of technology. It is proposed that the project improve the applicability of research to small holder needs and the dissemination of technology through better research and extension service. These recommendations need to be pursued while avoiding the mistakes that have been made in agricultural experience.

Besides weaknesses within agricultural research and extension service institutions, both agriculture and horticulture suffer from a crucial weakness related to linkages with other institutions with relevant data and research capacities. Two stand out: the universities and the Central Bureau of Statistics. These and other institutions conduct studies which provide for an analyses of different aspects of farming system in different parts of the nation and in other parts of the world. There is need for improved access to available information and the interpretation of the information as it relates to the implications for agricultural and horticultural research and extension.

### C. Participation

The reorganization of the agricultural research system as proposed involves committees at different levels to help facilitate participation in the establishment of research priorities and allocation of resources. Moreover, the emphasis this approach places on on-farm research is based on the premise that farmers ought to be involved in determining areas for research and the testing of plausible recommendations. Furthermore, it recognizes that farmers are very heterogeneous and hence recommendations must be based on specific farming conditions. To help ensure that farmers participation is meaningfully sought and utilized, the project entails the involvement of economists and sociologists.

For meaningful participation of all farmers to be enlisted there needs to be a fairly sensitive interaction between small scale farmers and extension personnel. Social scientists - sociologists and anthropologists are probably best at facilitating such an interaction. At the same time, since the majority of small scale farmers in Kenya are women, extension services need to deploy more women than they do at present (see below).

#### IV. Sociocultural Feasibility

##### A. Population and Demographic Considerations

Kenya's agricultural policies and programs need to take into account the dynamics between various development efforts and demographic facts. In terms of the proposed project three factors appear to be significant: employment, migration and urbanization trends. The growing labor force will need to be absorbed mainly in the agricultural and horticultural sector. Intensification of land use in the high and medium potential areas will therefore be essential for the absorption of the growing population and meeting household needs as well as taking into account the growth of market centers and towns. While agricultural research particularly on maize is expected to yield results in the medium term, it is imperative that in the long run the risk to crop production be reduced for the semi arid land and coastal zone so that these areas are not turned into deserts and so that they can absorb more people into productive employment.

The rapid rate of urbanization means an increasing number of people totally dependent on purchased foods. A higher rate of productivity has therefore to be realized in order to feed urban populations. Adoption of the maize and other agricultural and horticultural research results, will in the final analysis be dependent upon their reliability and profitability and the reliability of the marketing system. To complement the project, USAID will continue to monitor the pricing and marketing of grain and to keep this as an important topic in their policy dialogues with the GOK.

While several contradictory hypothesis can be advanced regarding the implications of agricultural and horticultural policies and programs on fertility (see Mbugua and Schuter and Jones 1984), there is no evidence to indicate that the projects will have a negative impact on the goal to reduce fertility areas. The intensification of cropping patterns, especially of grains is unlikely to increase the family size by enhancing the labor demand for children, because of the direct cost of rearing children. In fact, if small holdings are not made more economical by intensification of grain production to release land for higher

value horticultural crops, the value of children to diversifying household sources of income may become even greater.

#### B. Food Consumption and Nutritional Considerations

A meaningful proportion of the small scale farming households are not self-sufficient in the staple grain foods nor in other crops. Moreover, evidence indicates that cash from sale of crops and labor is either insufficient or is not adequately allocated for purchasing food within a number of households, and hence results in the low levels of nutrition found among children. Women are both primarily responsible for domestic food production and for feeding their families. Increased yields, in volume and caloric content, should help improve access to grains for household consumption, and sale of high value horticultural produce should bring about the needed cash as well as satisfy nutritional needs.

In the more marginal, dryland areas access to food is more problematic than elsewhere. These projects will address this problem through support for research on maize, millet and sorghum applicable to farming systems on a nationwide basis, including the semi-arid zones. A farming systems approach will be necessary to understand household strategies and the interaction between crop and livestock systems. Moreover, a multi-disciplinary approach is required so that maintenance of the resource base (i.e. soil fertility) and water retention are incorporated in the research on grains and other crops.

An important responsibility of the agricultural researchers will be to identify areas in which applied research is required based on information on farmers' conditions and a preliminary economic analysis of proposed trials to match trials with specific target groups. This ought to precede the allocation of research funds. Also, the economists should be responsible for assisting researchers to analyse their results in terms of crude caloric yields and when appropriate crude energy yield. In this way, caloric yields as well as economic criteria can be used to make comparisons between different improved technologies. The research trials on maize and horticultural crops will also include intercropping and agroforestry combinations since farmers tend to intercrop maize with other crops and because of the potential effect on soil fertility and environmental conservation in the case of agroforestry.

These projects should address the food consumption perspective to on-farm research and experimentation, and to the usage of the Agricultural Research Fund. The production - consumption linkages which might be addressed are the role of women in production, crop labor requirements, market prices and their seasonality, seasonality of production, crop mix and minor crops and income. (see USDA and AID 1985).

### C. Feasibility of Proposed Institutional Building

The critical need for building Kenyan capacity to manage all facets of agricultural and horticultural research has been discussed at length in other sections of the Project Paper. (see Annex G.1. (a) Institutional Analysis and Unattached Annex H.3.). Important to building a long-lasting institutional capacity to plan and conduct research is developing sufficient linkages between the researchers, extensionists and farmers.

The maize, sorghum, millet project design recognizes this area as being vital and assigns a high priority to linking AID project activities with CYMMYT and IBRD efforts in on-farm testing and extension. As with the reorganized agricultural research structure, the areas of on-farm research and T&V extension are still evolving in Kenya. Delineating precise lines of organizational linkages is not practical at this time. The research project place great significance on fostering close collaboration between research and extension as evidenced by the important role given the technical assistance agronomists to be posted at Regional Research Station (Kakamega and Embu). These individuals must have strong backgrounds in farming systems work in addition to coarse grain agronomy.

In horticultural crops, the recent reorganization of the establishment and operation of the seedling nurseries by the Horticultural Crops Development Authority is expected to reinforce extension's capacity to facilitate farmers' access to good quality materials. Research capacity could also be improved by linkages forged between institutions concerned with horticultural research both within Africa and internationally.

The projects also allow for short-term consultancies throughout their course to assist, as needed, in bolstering the socio-economic capabilities of KARI. Post graduate degree training will be available in relevant socio-economic disciplines to help develop a solid Kenyan base in this important field.

**ELIMINATION OF RISKS TO FARMERS:** There is an element of risk to being a cooperating farmer. Experience has shown in other countries in the region that cooperating farmers tend to be from high resource households. To facilitate the on-farm research teams working more with "average" resource farmers, all agricultural and horticultural projects should urge KARI to establish a compensation account to be used to reimburse farmers for financial losses which occur owing to failure of the technology or through negligence of the on-farm teams. Such a fund will also assist in the establishment of credibility of the on-farm teams among farmers.

**FEEDBACK FROM FARMERS:** For the on-farm experimental work on any crop to be meaningful, explicit institutional mechanisms are necessary to feed information from farms to research personnel so that their work addresses actual farming conditions. This will occur in two ways: senior researchers from the national maize program and Horticultural Crops Division will attend the station research discussions when the kind of on-farm trials are to be decided. The senior researchers are expected to assist in the identification of options to address the problem areas for which no proven technological recommendation are available. Also the senior researchers will participate in sessions at the close of each season when the results of the on-farm experiments are discussed and at these help to identify changes which might be required. Attention should be given to reasons for "failures" and "drop out" of cooperating farmers.

Specific mechanisms will be instituted at each commodity station to ensure that the annual program of work incorporates research based on feedback from farmers. It is expected that each scientist or group of scientists will present their work plans. These will be reviewed and aggregated into a station plan. It is recommended that the individual proposals receive peer review to help ensure that the elements address priority considerations and are well designed.

**GENDER ISSUES:** Gender issues will be addressed in activities receiving support from the Agricultural Research Fund, and by the agricultural and horticultural research station staff complemented by consultancy services. The formal and informal surveys carried out by the on-farm research teams and complementary research by consultancy are expected to address the main gender issues, such as rights to decide on technologies used on maize fields and for other crops. Furthermore, it is mandatory that the possibility of the suballocation of land within the household be understood.

As was indicated during the informal surveys done by the Coastal Institute, and elsewhere, researchers may have difficulties in interviewing women when the teams are composed only of males. Women farmers are less likely to give reliable information to a male than a female interviewer, because the answers are apt to reflect gender expectations rather than the actual situation. Field day attendance indicate that women are always in the majority, and therefore, are quite receptive to extension advice. This means that women are the most appropriate link between research and extension. The challenge is then to facilitate ways of communicating the appropriate messages of technology transfer to women. One way of doing this, it is suggested, is to deploy more women as extension officers and having on-farm research teams comprised mainly of females. Administrators of all projects should help to monitor these procedures and make the necessary adjustments.



This recommendation may however be difficult to implement as long as the extension service within the Ministry of Agriculture itself is dominated by men. Out of a total of 4500 personnel holding certificates, only 25% are women. As one moves up to senior levels (to senior agricultural officers and above) only eight are women. Similarly, in KARI, there are a total of 6200 employees out of whom 1,320 are women. Of these employees, only 532 are scientists while the rest are support staff. Men scientists number 484 compared to 48 women. Of the women scientists 43 have M.Sc and 5 have Ph.Ds. For men 174 have M.Sc and 25 have Ph.Ds.

It should be noted that women are the mainstay of the agricultural labor force and have the main responsibility for labor on food crops. Historically, cash crops were introduced as men's crops. Cash crops have received a great deal of support in form of credit, input supplies and extension service to facilitate the increase in productivity. This had not been the case for food crops which have evolved as women's crops. It has been estimated that 80% of Kenyan population live in rural areas, of these 70% manage small holdings. Of these farms over 70% on average (90% in some areas) are managed by women who are either unmarried or whose husbands have migrated to urban centers in search of employment (see Kimani 1990). Now, women have gradually taken over the responsibility of farming to support both the commercial and food needs of the rural households. Because of this centrality of men, more women farmers should be recruited as cooperating farmers. Both married and unmarried female heads of household should be recruited. Also, households where the male head is resident but not a fulltime farmer ought not to be ignored. If the range of different structures of agricultural households as well as different levels of resources are not brought into the on-farm research work, it is likely to have little applicability. Kenyan farmers classify themselves and others based on availability and access to key resources; demonstrated success by a member of one's group should have an impact on others from the group. Therefore, the criteria for selection of cooperating farmers ought to include a provision requiring that a representative proportion be female farmers.

Even in the basic and applied research work on maize, and other crops a bias of male/female domination could become evident if it did not take into account the demands on women's labor. This should be monitored in the periodic evaluations of any projects.

The use of the Agricultural Research Fund is also expected to address gender issues through support to socio-economic inputs to farming systems research and to on-farm experiments as well as studies which address production - consumption linkages. The periodic project evaluations will include an assessment of the use of the Fund to determine if the type of agronomic work is biased against female farmers and if other gender issues are being adequately addressed. To be gender sensitive, the following

indicators should be used in all ongoing and proposed projects to monitor the integration of women in all projects.

- o Sex-disaggregated data in all references to participants and beneficiaries.
- o Constraints to women's participation in all project activities.
- o Opportunities for enhancing women's participation;
- o Strategies to overcome these constraints or to make use of these opportunities; and
- o Benchmarks to measure progress in implementing these strategies.

#### D. Linkages Between Institutions

The Project addresses the establishment of an effective system of linkages between the public and private sectors, including the agricultural college and university research communities as a means to making the available research results applicable to various farming systems in Kenya. The linkages will be established in the following ways.

First, to help ensure that data on aspects of gender and socio-economic factors are accessible to the commodity and regional research centers, funds will be available to contract with people from other institutions to carry out work on a complementary basis with the on-farm teams. The work can consist of the processing and interpretation of existing information or the collection and analysis of new information. Priority attention will be given to use of existing information. For example, consultants would be hired to program, analyse and interpret data from CBS surveys on farming households within the ecological zone covered by Embu maize research stations. Also, to help ensure that the on-farm work has a systems approach funds will be available to hire rural sociologists and agricultural economists from other institutions to design and carry out complementary work with the on-farm teams. For example, consultancy work would focus on the households who participate on the household production strategies and sex differentiation of households who participate in the on-farm trials. It is not practical to expect that the socio-economists from the research stations will initially have the expertise or time to do this work. Gradually the direct use of personnel from other institutions should diminish as the research station socio-economists gain experience and then funds will be available to hire local data collections, e.g. for labor input information on trial and comparative plots. Moreover, the staff from other institutions

may begin to incorporate a farming systems perspective in their normal research work and publications.

In addition, the Agricultural Research Fund will be geared to promote linkages between institutions. It is anticipated that many institutions applying for funds do not have adequate staff and hence will have to cooperate with persons from other institutions. Some proportion of the funds are expected to be allocated to groups to do farming systems research, and hence incorporate socio-economic and gender dimensions.

Despite past efforts, little has improved in the establishment of closer linkages between research and extension services. The question arises: If viable technologies are identified for specific farming systems, is the extension service capable of disseminating these? The limited number of farmers directly served under the Training and Visitation System and its lack of attention to different farming systems makes reliance on the extension system questionable. However, dissemination need not be totally reliant on MOALD extension service. While the service will be needed to carry out demonstration trials, it can be anticipated that dissemination of information will occur through government officers, public sector leaders and commercial enterprises. Also, NGOs may be expected to incorporate the technologies into their projects. For this to occur, it will be necessary for the research system to make the requisite information available.

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### Financial Analysis Update

In a report prepared by Price Waterhouse for USAID/Kenya in February, 1992, in support of preparation of the National Agricultural Research Project Amendment, special emphasis was placed on analyzing KARI's operational costs and implications for sustainability of the research program over the longer term.

According to the PW report, over the past five years KARI has operated with an insufficient level of funding. Inherent debts from the various ministries, inefficiencies and unbudgeted costs were all transferred to the new reorganized KARI. Over the last few years there has been additional burden on finances. A payroll shortfall of U.S. \$103,450 (KShs. 3 million) per month over the past few years has resulted in a substantial deficit in the recurrent budget. In 1989/90 the estimated shortfall in the recurrent budget totalled U.S. \$1.8 million (KShs. 54 million). The accumulation of shortfalls during the Phase I period led to an amount owing to suppliers and payroll creditors totalling U.S. \$3.3 million (KShs. 96 million). Over the last several months, pressure from KARI on the Government of Kenya (GOK) to release recurrent funds has been reasonably successful, resulting in the reduction of the outstanding debt. The shortfall in the financial year 1991/92 under the recurrent budget was reduced substantially to U.S. \$310,000 (KShs. 9 million).

The roll-on effects of these problems has held back progress and has resulted in KARI relying heavily on donor support. Full GOK support is essential during Phase II to prevent again the build up of additional external debts and donor funds being re-routed to pay for essential operational activities. However, for KARI to be able to sustain research at acceptable levels with the existing number of programs at centers around the country, KARI needs to identify alternative funding sources. It is highly probable that donor financing will be reduced over the next several years and the GOK, under external pressure to reduce spending, cannot be relied on to provide significant additional levels of funding.

There are a number of opportunities for KARI to either institute new cost saving measures and/or generate new revenues. In fact, KARI is moving forward on both fronts and with continued focused support from donors will have made significant progress by the end of Phase II. For example, over the past three years KARI management has reduced overall staffing levels by over 500 personnel. If this trend is continued and accelerated, substantial savings will be realised. The total number of staff on the payroll at the end of December, 1991, was 5,772. If further reduction of

approximately 2,000 staff occurs during Phase II, it would reduce payroll costs by an amount in excess of \$3.8 million or KSh. 100 million per annum.

On the revenue generation side KARI is taking equally positive steps. KARI currently generates additional funding from various commercial activities including farm produce, vaccines, rentals, fees for service and license fees, among others. Total revenue generated from these sources over the past three years are as follows:

1988 - 89	KShs.	11,910,000
1989 - 90	KShs.	16,834,571
1990 - 91	KShs.	29,307,574

KARI is also involved in contract research and is continually seeking new opportunities for revenue generating collaboration with private sector firms and other entities. On-going efforts include contracts with Kenya Breweries, Kenya Seed Company and Oserian Development Company. Other commercial and contract research opportunities are currently being examined by KARI and offer considerable hope to put agricultural research on a more solid footing.

If the above cost saving and revenue generating initiatives are pursued and expanded upon, KARI will very likely realize the goal of bringing the ratio of research personnel costs and research operational costs into a more proper balance. International experience indicates that a ratio of 60% of budget allocated for personnel costs and 40% for operational costs is reasonably correct. When KARI came into existence the ratio stood at 90/10 considering only GOK budget inputs. Today the ratio is 80/20 and with continued innovativeness on the part of KARI and understanding and focused budgetary support by donors over the next five years, the likelihood of KARI realizing the accepted 60/40 ratio is almost certain.

During Phase I, USAID and other donors clearly recognized that in order to nurture KARI's development while producing critically needed agricultural technologies, as well as supporting their own resource investments, it would be necessary to provide limited recurrent operational costs. USAID through programming of counterpart funds (CPF) generated from the sales of fertilizer and other commodities was able to not only relieve the burden on a financially strapped government but also allowed research programming to continue and provided critical support to other USAID/KARI investments.

Now, however, as Phase II begins, the availability of counterpart funds is ending (CPF is sufficient to cover requirements in year 1 and 2 of the Phase II project). Consequently it was deemed necessary in the design of Phase II to seriously consider the

provision of U.S. dollars to compensate for the loss of CPF's and to assure the continuation of progress made in research technology development and the introduction of cost saving measures and revenue generating activities.

During the latter stages of Phase I, USAID aggressively promoted the idea of program budgeting. This approach, while meeting with some resistance early in the process, forced researchers to plan and clearly identify not only their program objectives but also the budget resources required to achieve those objectives. It was really only during the 1991/92 cropping seasons that this approach was successfully initiated. It was, as necessary to be successful, coupled with decentralization of decision-making and budget control.

As a result of this limited but quite successful beginning, KARI researchers were in an excellent position to determine not only a rational research program, but one which identified the resources required to carry it out. During the Phase II design which represented a highly collaborative effort on the part of KARI and USAID personnel, scientists were asked to design research programs based on the priority setting exercise KARI had completed in 1990, and to determine budgets required to realize their objectives. They were also advised that they would be held accountable for results.

Research programs with required budgets were developed for maize, sorghum, millets, horticulture, small ruminants and administrative areas. Program committees carefully identified annual work plans and costed each with considerable detail. These program plans were then reviewed by KARI senior management and MIAC staff. This effort represented a giant step in rationalizing KARI's research program and assuring that plans were not only consistent with needs but also reflected available resources.

Given this important first step in program budgeting and coupled with positive initiatives being undertaken by KARI in other areas, it is essential that recurrent costs be supported by USAID and other donors. Not only will this allow for the further development of the system, but equally important will allow for the continued development of agricultural technologies so desperately needed by Kenyan farmers and the nation itself.

The following program budgeting exercises represent the first attempt by KARI staff to tailor program needs with available and often limited resources. Commodity programs areas such as maize offer an opportunity for greater precision in calculations because of the longer history of USAID involvement. Horticulture on the other has received little guidance in the past and as a result the projections are more tentative. We will expect that as KARI develops more experience in program budgeting, the level of detail and precision on actual recurrent costs will improve each year.

The objective behind providing recurrent costs is to assure that adequate funds are available to carry out the required activities and fully utilize the manpower and other resources available to generate new and appropriate technologies.

Recurrent cost funding under Phase II will only be provided after KARI scientists develop commodity programs with appropriate and adequate budgets. As this will be a CP in Phase II, we are assured that adequate detail will be provided prior to the release of funds. The line item amounts included in the Phase II budget are illustrative only and actual amounts to be provided will be dependent on satisfactory program budgeting exercises done on an annual basis.

The sorghum/millet and maize program budgets that follow are presented as illustrative examples of the process to be followed in all commodity areas with the understanding that more detail and accuracy will be required for each additional year of program budgeting experience.

**CPF Funds (\$ Equivalents) Required for Support to  
Program in 1992/93 and 1993/94 Kenya Fiscal year**

Program Area	1992	1993	Total
Planning & Management	0	0	0
Maize Program	123,677	129,861	253,538
Sorghum/Millet Program	55,805	58,595	114,380
Horticulture Program	60,000	63,000	123,000
Small Ruminants	50,000	52,500	102,500
Agricultural Research Fund	7,000	7,000	14,000
Totals	296,482	310,956	607,418



**SORGHUM/MILLET BUDGET (Ksh.)**  
**PHASE II**

Research Centre	1	2	Year 3	4	5
Coordination	150,000	157,500	165,375	173,643	182,326
Katamani	647,095	679,450	713,422	749,093	786,548
Kakamega	416,026	436,827	458,669	481,602	505,682
Embu	55,995	58,795	61,734	64,821	68,062
Lanet	224,056	235,259	274,022	259,373	272,341
Kisii	50,024	52,525	55,151	57,909	60,804
Perkerra	72,589	76,218	80,029	84,031	88,232
Mtwapa	58,366	61,284	64,349	67,565	70,944
	1,524,153	1,600,360	1,680,379	1,764,398	1,852,617

Equivalent US\$	55,805	58,595	61,525	64,601	67,831
Budgeted	0	0	65,000	65,000	70,000

**MAIZE RESEARCH PROGRAM (Ksh.)**  
**PHASE II**

Research Centre	1	2	Year 3	4	5
Coordination	170,000	178,500	187,425	196,796	206,636
Kitale	2,009,455	2,109,928	2,215,424	2,326,195	2,442,505
Katamani	254,343	267,060	280,413	294,434	309,155
Muguga	360,253	378,266	397,179	417,038	437,890
Embu	308,750	324,188	340,397	357,417	375,288
Mtwapa	220,432	231,454	243,026	255,178	267,936
Kakamega	220,424	231,445	243,017	255,168	267,927
Perkerra	107,250	112,613	118,243	124,155	130,363
Kisii	59,400	62,370	65,489	68,763	72,201
Totals	3,710,307	3,895,824	4,090,613	4,295,144	4,509,901

US\$ Equivalent	123,677	129,861	136,354	143,171	150,330
Budget	0	0	135,000	145,000	155,000

## ANNEX E

### Technical Analysis Update - Research Planning and Management

#### I. Background: Kenya's Approach to Agricultural Research

The Technical Analysis for the original project paper described and commented on the Kenya agricultural research situation through 1986. It will be referenced here but not repeated. Instead focus will be on updating the analysis to include developments for the period 1987 through 1990 and elaborating on those elements which represent new emphases.

Organizationally, much has happened since 1986 in terms of how Kenya has organized itself to conduct agricultural research. In 1985 at the request of the GOK, ISNAR developed a strategy for the organization, structure, programs and priorities of a national agricultural research system for Kenya. Foremost among those was to be the establishment of a National Agricultural Research Project implemented by a new institution--the Kenya Agricultural Research Institute (KARI). With considerable donor support, the GOK has moved to implement the major components of the NARP including the consolidation of KARI, creation of National and Regional Research Centers, improved management structure within KARI, prioritized research programs, coordinated research programs, staff training, new schemes of service for employees, research/extension linkages, provision of technical assistance and multi-donor financing. While progress has been made on all fronts, particularly noteworthy are the following developments all of which have occurred since 1986:

- o A new KARI has been formed which has the status of a parastatal with an independent Board of Directors reporting to the Minister of Research, Science and Technology. This organizational structure has been stable for two years.
- o An internal reorganization of the KARI management structure which has emphasized clearer lines of responsibility and efficiency of decision making.
- o A new scheme of service designed to keep and attract skilled employees.
- o Installation of new management support systems designed to provide KARI Management and the donor community with the information required.

It is USAID/Kenya's assessment that the GOK has lived up to its organizational commitments and that a well-established foundation

is now in place upon which further improvements in planning and management can be added. The GOK and KARI have gone much further than simply redraw organizational charts. A completely new organizational model with new procedures, modes of operations and policies has been established which, for the most part, has taken into account the unique needs of an organization whose primary outputs are in the area of knowledge creation.

## II. Technical Feasibility of Expected Outputs

Much of the analysis in the original project paper remains valid and will not be repeated here. The NARP was planned as a long term effort and while great progress has been made during the first four years there is still a need for carefully targeted assistance. The changes proposed are evolutionary, not revolutionary, and are designed to institutionalize the investments that have already been made and enhance other areas of management which were not able to be addressed in Phase I.

### A. Office of the Director

Technical assistance to the Director's Office will be in three forms: Long-term assistance(7-8 person years); short-term assistance in planning, program budgeting and other areas as needed; and short-term training in the form of management tours, management/leadership seminars and executive short courses.

The Research Management Advisor, who will also serve as the contractor's chief-of-party, will have the responsibility of being a key advisor to the senior management team at KARI, maintaining contact with other donors (e.g. ISNAR) to insure that duplication of effort is minimized or eliminated and that the timing of inputs is maximized, and coordinating all other inputs being provided by the contractor. We anticipate a gradual transition in these inputs from long-term TA at the start of PHASE II to increased use of short-term recurrent TA as the project progresses. Maximizing the use of these inputs will require a significant portion of the Research Management Advisor's time.

In order to strengthen the systems for monitoring and evaluation, two principle strategies will be employed. First a long-term monitoring and evaluation specialist will be assigned to the unit charged with this responsibility. It is anticipated that this individual will serve a two-three year tour. She/he will be supplemented by short-term consultants in specialized areas. In addition, long-term PhD and MS degree training in disciplines relevant to monitoring and evaluation will be undertaken as well as targeted short-term training for KARI management personnel. In the

final section of this analysis there is a well developed plan for an management and evaluation system for KARI.

#### B. Finance and Administration

Considerable progress was made in this area during Phase I of the project. Computerized systems for payroll/personnel, accounting and fixed assets management have been installed on two local area networks (LANs) in KARI headquarters and are now fully operational. Current efforts are focused on training KARI personnel to assume administrative/management responsibility for these systems with contractor/subcontractor roles shifting to that of consultant from that of implementor and manager. It is anticipated that this transition will be fully accomplished by the time Phase II begins.

While KARI is now on the threshold of taking total responsibility for its administrative support systems, a modest amount of technical assistance and training and some additional commodities will be necessary in Phase II to insure that the systems are properly maintained and that a critical mass of personnel familiar with their use is available at all times. In addition there is a need to expand the automation process beyond KARI HQ to selected centers. Finally, support for the enhancement of some of the existing systems to automate closely related tasks is planned for Phase II. For example, the current Fixed Assets management system might be modified to allow the inclusion of consumable supplies (e.g. fuel, fertilized, seeds etc.).

Issues related to the management and maintenance of research centers will received increased attention during Phase II. The analysis in the original project paper remains pertinent except that it should be noted that the physical deterioration of structures and the shortage of space at many centers should be significantly resolved via the support KARI is receiving from the World Bank. USAID support will focus on the development of plans and procedures for maintaining facilities and equipment and on the training of center personnel (technical and administrative personnel) in the implementation of those procedures.

#### C. Human Resource Development

While major progress has been made in establishing an accurate picture of KARI's human resources and putting the data into a form where it can be used for planning and management decisions, much more attention needs to be given to this area. Coordinating the training activities of a large number of donors and building a personnel data base for over 6000 employees (570 scientists) who were previously located in two ministries has been a formidable challenge. However, with a reasonably accurate picture of the current situation, attention can now be focused on planning for

KARI's human resource needs in both the scientific and support staff areas. This activity will have to be closely coordinated with the efforts underway to establish priority research areas and questions related to the allocation of resources. In addition, this office will need to move in the direction of building in-service training programs for a wide range of KARI employees. In all of these undertakings a moderate amount of short-term technical assistance will be required complemented by the contribution of the long-term research management advisor discussed above.

### III. Appropriateness of USAID Assistance

The nature of the assistance to be financed by USAID is substantially the same as was true during Phase I although the areas in which the assistance will be targeted will shift substantially. Specifically, attention will shift from developing and installing administrative systems to fully utilizing those systems as decision making tools. Both require a mixture of long and short-term technical assistance but the nature of what is being done changes radically. Those involved will see their roles shift from "doer's" to "advisors." Overall, substantially less technical assistance will be required for this component than was true in Phase I.

Limited long-term training directed toward improved management is planned for Phase II along with a marked increase in short-term training opportunities for both senior and mid-level KARI management and technical/administrative support staff. Management tours, short courses, internships and similar experiences have all proven to be effective tools to promote change and an expansion of these activities is planned for Phase II all of which was anticipated in the ten year project design. The targeting of monitoring and evaluation systems for attention in Phase II will require, in addition of long-term and short-term technical assistance, some long-term degree training to enhance the skills of the individuals assigned to this unit.

Since the original project paper and accompanying analyses were prepared, a number of other donors (12 in all) have signed-on to support the NARP. There has been a remarkably successful effort to coordinate donor activity which has resulted in minimal duplication of effort and relatively clear-cut divisions of responsibility. Within this component only the World Bank and the European Community can be said to have any activities at all. In the case of the World Bank, they are supporting physical infrastructure development, equipment procurement and technology transfer activities. The first two clearly complement USAID's activities and the third will be discussed in Component 2.

The situation with regard to the EC is somewhat more complicated but manageable. The EC has negotiated an agreement with the

International Service for National Agricultural Research (ISNAR) to implement a management training program for KARI staff. To date ISNAR has conducted approximately five workshops for KARI management (headquarters and centers) on such topics as priority setting, scientific writing, analysis of data, and managing personnel. While ISNAR's and USAID's activities have to date been complementary, special attention will be given to insuring that close coordination and communication are maintained in the future. Already, representatives of the current USAID host country contractor have held discussions with ISNAR senior staff for the purpose of fully informing all parties about current activities and plans for the future.

#### IV. KARI MONITORING AND EVALUATION SYSTEM

The need and justification for a comprehensive monitoring and evaluation system for KARI have been widely and repeatedly expressed during the first phase of the NARP. Various project evaluations by individual donor teams, reviews by multi-donor teams, and the top management at KARI have all clearly stated the need for a comprehensive, multi-faceted, computerized monitoring and evaluation system as an critical management tool within a management information system.

Some of the uses of such a system are obvious: strategic planning, policy formulation, budgeting financial resources, prioritizing research thrusts, recognition of unit performance, and measurement of progress toward institutional objectives. Other tasks for a monitoring and evaluation system, while perhaps not immediately as obvious, are perhaps even more important. In addition to tracking the development of the institutional base itself (KARI), the system must:

- o provide tracking of technology generation and transfer to clients (e.g. farmers, marketers, processors);
- o provide tracking of the intermediate impact of the technology generated, its adoption by target groups, and/or severity of constraints limiting adoption; and
- o track the long-term impact of KARI's technology generation process on national goals such as increased agricultural productivity, increased net farm income, improvement in national food security, and agro-industrial transformation.

Needless to say, any monitoring system which meets these objectives will require extensive data collection and management to provide--first and foremost--a baseline against which progress can be charted.

Above all else, if the M&E system is to be useful and sustainable, it must truly be KARI's system--not a donor-imposed condition or donor-serving data collection system. KARI management and researchers must see the utility of the system, have a stake in its implementation, and contribute to its maintenance.

Much of the data collected for KARI's M&E system will have to be generated at the research project level, checked for authenticity by the RRC or NRC director, passed to the M&E unit, and then (and ONLY then) aggregated. There is no way such data can be generated "from the top down".

The M&E system must be integrated into KARI's overall work objectives, so that the M&E unit will not be seen as extrinsic to the concerns of researchers, or as a "policing" or "auditing" function.

While the M&E system's data will largely be generated "from the bottom up", the establishment of the M&E functions will have to come "from the top down". In other words, it will have to be mandated by the director of KARI. Recent experience of the small M&E unit established in 1989 clearly demonstrates that the provision of data from the research centers on a voluntary, survey basis will not occur.

Data which will drive the M&E system must be reported on a timely basis if the system is to be useful for KARI management. Quarterly reporting of most data is desirable, but for the initial implementation of the system semi-annual data reporting may be a more realistic objective.

The sheer magnitude of the data collection and reporting function dictates that the entire M&E system be computerized. The M&E database will have to accommodate both quantitative and qualitative data, but this can readily be done with the use of micro computers such as those already in place at KARI. Consider the following numbers: KARI has some 30 research centers and substations, up to 900 separate research projects, some 550+ researchers, and more than 6,000 total personnel. Even semi-annual reporting on these components will require at least several functioning micro computers and trained operators, plus professional staff experienced in agricultural research and trained in monitoring and evaluation techniques.

Although data collection for the M&E system will occur throughout KARI, the M&E unit will have to be centrally located in KARI's headquarters to be constantly available to management. The centralized location should be accomplished when KARI moves to its new headquarters building.

By now it should be clear that if a functioning M&E unit is to systematically provide timely data to KARI management and

researchers, real resources (staff, work space, equipment, and funding) will have to be allocated by the director of KARI. Furthermore, the unit will have to function under a clear mandate from the director of KARI: the directors of NRCs and RRCs will have to be held responsible for ensuring that data are provided on their respective research projects by their respective researchers.

Lastly, if the management of KARI chooses to implement an M&E system with the self-serving characteristics described above, it will in all likelihood satisfy to a high degree the reporting needs of KARI's various donor organizations. In fact, several donors are probably willing to support this M&E effort to some degree.

## V. SCOPES OF WORK FOR TECHNICAL ASSISTANCE TEAM

### A. Research Management Advisor/Chief of Party

#### 1. Qualifications

This individual will possess a PhD in an agricultural discipline and have experience as a research administrator. Overseas experience in a developing country agricultural institution is highly desirable. The individual's experience should include, executive level experience in managing an agricultural research organization including resource allocation, establishing priorities, developing MIS data bases, fiscal administration, linkages with extension, and assessing program quality. In addition, the individual will need to be experienced in managing the multiplicity of technical assistance and training activities planned for this project.

#### 2. Duties and Responsibilities

The RMA/COP will assist the KARI Director, and other senior KARI staff in the following areas:

- o Assist the Director in identifying areas of management weakness and implementing corrective measures.
- o assure that appropriate short-term consultants are effectively and efficiently used to strengthen KARI management.
- o Provide assistance, as requested, to the KARI Director on any managerial issue emerging during the implementation of new policies and procedures.
- o Serve as a source of research management expertise advising senior management on such issues as program evaluation



techniques, peer review procedures, resource allocation options, strategic planning, use of information in decision making and priority setting.

- o Serve as the leader of a 5-7 person technical assistance team.
- o Assist with planning short-term training opportunities and facilitate the long-term training program.
- o Maintain a well-managed project support office.
- o Assist in the procurement of commodities for KARI.

## B. Monitoring and Evaluation Specialist

### 1. Qualifications

The individual will possess an MS or PhD(preferred) in agricultural economics or a closely related field. Experience with developing and maintaining data bases on micro-computer systems is essential. A strong background in program planning, financial planning, policy analysis and administration is highly desirable. Experience in the application of management information systems for program planning in a research organization environment is also desired as is solid academic training in statistical sampling and analysis techniques. Developing country experience will be favorably considered.

### 2. Duties and Responsibilities

This position will be a senior advisor to the newly established monitoring and evaluation within KARI (Policy Research and Technology Transfer Unit). He/she will work closely with the RMA/COP and have responsibility for the following tasks:

- o Help energize a monitoring and evaluation system in KARI through the construction of MIS data bases and demonstrating their use in research management decision making.
- o Serve as a senior advisor to the social science group within KARI inters of their several roles including support for on-farm research and assessing the macro level impacts of research.
- o Work with other technical assistance personnel in the development and implementation of a computerized information data base.

- o In collaboration with KARI personnel, establish the necessary prerequisites for the M&E system described in detail in the Technical Analysis for the Planning and Management Component.

### 3. Special Skills

- o Full micro-computer literacy in database management programs such as DBASE III, Lotus 1-2-3, and other spreadsheet, word processing and graphics programs commercially available.
- o Previously demonstrated ability to work on a collegial basis with host-country counterparts.
- o Demonstrated ability to work with agricultural scientists in all disciplines and at various levels of training.
- o Cross-cultural sensitivity.

## Technical Analysis Update - Maize and Sorghum/Millet

### I. Background

#### A. Introduction

A detailed historical and conceptual analysis of Kenya's approach to technology development and dissemination is given in the Annex of the Phase I document. Agricultural technology development has been active since colonial times, and a series of experimental centers have been established to provide technology for each major agro-ecological area. The program still suffers, however, from structural and programming weaknesses, problems that were addressed directly by activities in Phase I.

As described in the original PP, a new model has been developed for technology development and dissemination in Kenya. A central feature is the identification of a series of high priority, national research programs that are directed toward a commodity through a national research center with strong linkages and coordination with regional research centers. The regional research centers also have active research programs for farmers in their region, assist with scientific competence and capabilities, and are involved in joint planning of research and release of new technologies.

Linkages between research, extension and farmers continue to be a problem as described in the Phase I document. The Phase I accomplishments were focussed on development of an administrative organization and maintenance of a solid research program during a period of time while a large number of scientists were being given additional training. Now that significant progress has been made on those two objectives, more emphasis will be given to scientist-to-scientist and scientist-to-farmer linkages during Phase II. Enhanced linkages with International Agricultural Institutions is also required. Much can be gained by these associations, especially through the better-trained scientific staff that is now in Kenya.

#### B. Rationale for USAID Assistance

Maize, sorghum and millets have consistently had a high priority in several analyses. This is well-documented in the Phase I Technical Analysis. Maize has consistently been ranked number one in Kenya because of its direct effect on income and subsistence of the rural poor. Sorghum and millet have a vast potential for expanding

production, both as food crops in geographic areas where maize is less well adapted, and for sorghum as a processed crop to help fill the rice and wheat deficit. Sorghum and millet also offer potential as an animal feed base.

Maize is a major agricultural commodity in Kenya, which is appropriately described in the Phase I document, and received considerable emphasis during Phase I. This is justifiable in that this crop contributes more than 20% of the total agriculture employment. Further, maize accounts for 78% of the total cereal consumption, 44% of the dietary energy needs, and 32% of the dietary protein needs in the country. Maize occupies 20% of the land with medium- to high-yield potential. It is the most important source of both income and subsistence for the rural poor, and any changes in level or efficiency of its output would have a major effect on overall national well being.

Sorghum is the second most important cereal crop after maize, and pearl millet and finger millet are grown widely for food, beverages and fuel. Maize is the preferred cereal crop where it is adapted agronomically, pushing sorghum and millet into dryer, more harsh environments which are usually associated with subsistence level farmers. Presently, Kenya has about 160,000 ha of sorghum and 60,000 ha of millet. About half of the combined production is in Nyanza, 23% in each of the Western and Eastern provinces, and 2% in the rest of the country. Sorghum and millet are relatively more drought tolerant than maize and are better adapted to the lower elevations and semi-arid areas of the country.

Currently, the population of Kenya is increasing at about 4% annually and there is a strong migration of people to the lower altitudes with their dryer conditions. Even though maize is the preferred cereal, the area available for maize production is rather finite and becomes rainfall limited. Thus, further increases in maize yield in the country will need to come from increased yield per unit land area and not from expanded land area. Incorporating more land into cereal production will, by necessity, require that alternative cereals, most likely sorghum or millet, will need to be grown. Therefore, emphasis during Phase II will be given to increasing the technology base for these important crops.

Sorghum and millet are primarily produced for home food consumption, but USAID strategy is to increase commercialization of Kenyan agriculture. Developing more uses and markets will depend on increased production of the commodity. These crops have clear roles to play in food security, intensifying meat and milk production, and saving exchange through wheat blending.

Emphasizing commodity programs and national planning will help develop food security through self-reliance and provide for economic growth. Breeding and agronomic programs for maize and sorghum/millet are being dispersed to agro-ecological areas to

better serve the local needs. Emphasis is given to adaptive trials to help transfer the technology. Phase II will place even greater emphasis on self-sufficiency of the Kenya scientist base in order to continue increasing yield and improve management of resources for cereal culture within the economic and practical constraints of the small farmer.

The maize and sorghum/millet programs allow models for management of research programs to be developed and evaluated. Now that the administrative process and the scientist base have been improved during Phase I it is imperative that some high priority programs be developed within that framework. These cereal programs, although of limited vigor, have been underway for some time. Sorghum and millet production is complimentary to maize and, except for the details of variety development, share many biological and agronomic features. Further, improvement in national output of cereal grains will depend largely on increased yield per unit area for maize. It is critical that sorghum/millet research also be conducted as there is still opportunity to expand the land area of these crops, especially in Eastern Kenya. There is also a great potential in sorghum and millet for increasing yield per unit land area.

## II. Maize Component

### A. Status of Maize Research

#### 1. Accomplishments

Output 1 was addressed through the KARI-MIAC effort to develop a functioning system of national planning and coordination of maize research efforts. A national maize coordinator position was given new visibility within KARI with the primary purpose of ensuring that jointly planned research programs are carried out professionally, on schedule, and that goals and objectives are oriented toward solutions for practical problems. The coordination for maize is administered through the Kitale Center, which has national responsibility to: 1) coordinate drafting of research proposals in the maize area, 2) prepare coherent research agendas and ensure they are carried out, 3) convene a "Specialist Committee" on maize, 4) develop working relationships with international and other country research institutions, 5) compile technical reports, and 6) maintain relationships with government and private agencies.

To a degree the national maize coordinator position existed before KARI was reorganized, but it is now more defined and has a stronger mandate. Emphasis is on coordinated multi-disciplinary research, hopefully involving scientists from more than one Center. There is also provision and encouragement for well-thought out basic and

strategic research that contributes to new knowledge relevant to immediate problems.

A research planning meeting was held in Kakamega in November, 1990, and included a partial review of the coordinator system. Staffing for the position appears adequate. Issues and concerns included mechanisms for strengthening the position and collaboration among researchers and Centers, and responsibilities of the coordinator relative to resource allocation and research management at the national and center levels.

In addition to the coordinator, the maize program has a broad-based specialist committee comprised of members from the public and private sectors and international organizations. The committee of experienced scientists meets periodically with the coordinator to contribute to the direction and quality of the programs. The committee accomplishes this by reviewing research results and recommending changes in direction or strategy, advising on relevant issues such as new problem areas, opportunities, changes in emphasis and adequacy of resources.

Maize research has been focused on areas based on agro-ecological zones, and is being given leadership from the respective Center. While these centers have the leadership responsibility it is expected that strong scientist linkages and research activity on specific problems will involve several Centers.

Zone and Altitude	Center Responsibility
Late maturity, high elevation	NARC-Kitale
Medium maturity, med. elevation	RRC-Embu
Early maturity, arid regions	NDFRC-Katamani
Coastal and lowlands	RRC-Mtwapa

While the above are slightly different from the ecological zones of Kenya described in the Phase I document (i.e. Western Highlands, Central Highlands, and Coastal Lowlands) the new designations and four categories are more realistic in terms of Kenya's needs and plant adaptation.

Maize breeding research has progressed during Phase I, but not at a rapid rate, due largely to having many of the scientists away for advanced degree training. The long-term technical advisors have helped immensely during the interim, and have provided leadership and counsel to keep the programs moving forward. The national performance trial for maize has been conducted annually in a wide range of locations that represent the breadth of agro-ecological zones.

Agronomic and adaptive testing of varieties and management practices has continued despite the temporary shortage of scientists. Considerable emphasis has been given to cultural

factors involved with productivity of maize such as plant density, fertilization practices, weed control, and pest management. Crop modelling research has been conducted in the mid- and lower altitude environments where limited rainfall and soil conditions cause more risk in the cropping system. Some emphasis has been on determining adaptation of maize in these marginal ecological zones relative to other cereal crops such as sorghum and millet.

The historical emphasis on maize in Kenya has been on breeding with good reason based on some successful germplasm and a need for good varieties. Area planted to maize has increased markedly over the past few years, however, and is now being expanded into areas where it is only marginally adapted. Technology regarding agronomic aspects, soil management and pest considerations have not been advanced as rapidly. Thus, current performance of maize in farmer fields is frequently only capturing 25% of the genetic potential for yield. During Phase II there will be a strong attempt to develop the trained scientists, the needed technology and the appropriate mechanisms for effective transfer of technology to the farmer.

There is a strong commitment among the maize scientists to complement their research mission with well-planned and integrative on-farm trials. All too often, however, the on-farm trial carries a lower priority during day-to-day decisions than does the on-station trial, and it often does not carry a multi-disciplinary approach. Also feedback from agriculturalists to researchers is not very strong. These aspects are emphasized more strongly in Phase II.

Some linkages have been developed with international research organizations and centers, probably more with the former than the latter. As the scientists return from their degree programs the need for interaction at these levels will be more apparent. Further, as individual scientists become more proactive in seeking outside funding and setting their own agendas this interaction should become much stronger. Currently, most of the interaction with these groups has occurred at the administrative level.

## 2. Deficiencies

During Phase I considerable progress was made in overcoming some of the program management details and in developing a much stronger trained scientific staff. There are still deficiencies, however in provision of operating expenses and administrative support. The maize program suffers some from having a major emphasis on breeding that is not complemented adequately by other disciplines necessary to develop and transfer the technology to exploit the genetic potential.

A specific shortcoming of the maize program is the relatively narrow germplasm base that is being used at the respective stations. While much early progress came from the material there is a strong need to introduce more variation into the lines used for selecting inbreds. Special efforts need to be made to consider a host of situations including maize streak virus resistance, striga resistance, insect resistance, disease resistance, seedling vigor, lodging resistance and low afla- and mycotoxin levels.

Another shortcoming is the paucity of information on production responses to environmental and pest variables, especially as they relate to inter-cropping or relay cropping systems. These interactions and main effects are paramount for developing and evaluating management systems and on-farm trials. Statistical methods, corporate goal setting and systematic approaches to solving multi-disciplinary problems are deficiencies.

Policies and procedures for interaction and exchange of germplasm with the Kenya Seed Company need to be developed with more clarity. Now that intellectual property rights in Kenya and the Seed Bank at Muguga have been established, it is critical that information flow from the breeder to the seed producer be efficient and mutually beneficial. Responsibility and procedures for germplasm release, germplasm preservation and seed increase need to be clarified.

The general education level of the maize scientists is still rather narrow and shallow. Special short courses or seminars need to be conducted on subjects such as applications of biotechnology, experimental design, timeliness of operations, conduct of on-farm trials and environmental safety. Opportunities for continuing education via libraries or professional meetings are very low.

Mechanisms for dissemination of research results are not clearly defined. Needs range from scientist-to-scientist scrutiny of research results to integration of multi-disciplinary efforts into on-farm trials to make effective extension lessons. Again, the scientists are enthusiastic about their research findings and about sharing the knowledge, but mechanisms must be developed, processes facilitated, and efforts rewarded.

### 3. Future Priorities

There is a strong recognition among maize scientists that they need help from associated disciplines. An informal survey among several maize scientists during May, 1991, revealed the following needs to balance the maize programs. Assuming the input to maize remains constant (maize=0) the ranking was as follows:



Discipline/Commodity	Ranking
Maize	0
Sorghum/Millet	+++
Soils (management)	+
Biotechnology	+
Horticulture	++
Socioeconomic	+++

The desire for sorghum/millet is a strong recognition that maize is not going to be expanding much into new areas of production, and thus production emphasis will be on production per unit area. Integrating the systems will require soil management for water conservation and pest management expertise (the latter was not included in the survey, but was clearly perceived to be critical, perhaps a ++), as well as a strong socioeconomic input. All scientists were interested in having interaction relative to the disposition and utilization of their ideas and results in on-farm trials.

Horticulture is broadly recognized as a complementary discipline in research as many horticulture crops are grown together with maize. There was less recognition of spinoff relative to research on post-harvest physiology and food quality aspects of horticultural crops. Interest in biotechnology emanated largely from a mixture of fascination and curiosity, the former because of the expectations and the latter as to whether it can deliver. Every scientist, however, agreed that KARI needed to provide broad-based educational programs on biotechnology and support efforts in biotechnology that had a reasonable chance for success.

The large gap between farmer yields and those obtained on experiment stations, and the reduced rate of new variety/hybrid releases both suggest needed priorities. New genetic sources need to be examined and tested for characters in Kenya. Likewise, realistic appraisals of yield-limiting factors (both biological and economic) need to be made. Concentrated efforts on developing sound technology, efficient on-farm trials, and effective technology transfer should help narrow the yield gap. Expanded efforts on germplasm evaluation with the added breeders should help solve the problem of the narrow gene base.

Incorporation of some biotechnology through RFLP mapping and better pest diagnostics should help the breeding programs. The additional emphasis on socioeconomic research and technology transfer should help narrow the yield gap.

#### 4. Constraints

In Phase I major progress was made on overcoming deficiencies of systematic management problems in the research system and to

specific shortcomings in each commodity program. The scientific staff in the maize commodity is now much better trained, but they still suffer from a lack of self-confidence and scientific maturity, inadequate operating expenses, and minimal administrative support. Much of the equipment and computers has arrived and are being set up, but without parallel increases in supplies, travel expenses and other expenditures it will be difficult to fully realize the potential gained from additional training and equipment.

A major problem is scientist morale after returning from training in the U.S. or elsewhere. While the scientists are enthusiastic about contributing to their country, they became accustomed to having good facilities and the ability to do their science in a timely manner. Thus, it is essential to have some long-term assistants to help with re-entry into the science community of trained scientists and for assisting on research programs being conducted in Kenya as part of the degree programs.

There are some major deficiencies in trained personnel at certain centers. Clear needs for expertise in soil fertility, soil management and socio-economic analyses are apparent.

## B. Technical Feasibility of Expected Outputs for Maize

### 1. Component Purpose

Objectives for the maize program in Phase I were to increase yield and to improve the management of the commodity program to achieve more efficient and effective research. The longer-term goal is to have the research program become self-sustaining with the ability to generate farmer-usable technologies for the different agro-ecological regions of Kenya. In addition, linkages among basic researchers, adaptive researchers, and the extension staff were to be developed to ensure that technical programs focus on practical solutions to real problems at the farmer level.

The Maize Research Component was designed to be integrally involved with the Planning and Management Component which is concerned with the operation of the national research system that maximizes the economic return to research investment. The maize program also is a major benefactor from the Human Resource Development Component of Phase I through the training of several M.S. and Ph.D students, and in the long-term technical assistance provided for Kenyan scientists before, during and after training.

Output from Phase I was focused on two major issues; 1) the lack of a coordinated research program among stations, and 2) the bias of maize hybrids available due to the preponderance of late-maturity genetic materials. In addition, a fundamental problem of research

emphasis on technology for the large land-holder was also raised. It was expected that this latter issue would be addressed indirectly through the expanded efforts on the other two issues. The large-holder bias was addressed through expanded integration of regional, on-farm research based on an appreciation of production issues faced by the small land-holder.

## 2. Identification of Expected Outputs

Expected outputs will be a more mature thinking and self-confident research staff that is more closely linked to the international community and to the needs of the small farmer in Kenya. As the degree training programs are reduced and the technical assistants are phased out the Kenyan scientists, through the national coordinator, specialist committee and other programs will have the necessary leadership and implementation skills.

Better planned experiments designed to meet a regional or national mandate will be more timely and focused to give better quality data for more credible interpretation. The system of on-farm trials will help focus the specific objectives and give an assessment of research progress. This will facilitate better linkages with extension and other means of technology transfer.

Some additional MSc. and Ph.D. Scientists will be available in strategic interest areas to augment the research and technology transfer efforts. Further, the entire staff will have more training and experience in computer operation, communication skills, and proposal writing for developing, implementing, and reporting research findings.

Some mechanism for recognition and appraisal of science will be established. Scientists-to-scientist interactions to allow in-depth evaluation and scrutiny of research will be operational. This will include library resources, outlets for publication, and opportunities for oral presentation of research results.

## 3. Activities to Achieve Output

Long-term technical assistants will be in the form of cereal (maize) breeders and agronomists. None will have an individual technical program, rather each will be working closely with the national coordinator and Kenyan scientists to achieve the national and regional objectives. Individuals will also serve as mentors for students doing research for advanced degrees and facilitating re-entry of degree recipients into the scientific arena.

One breeder/agronomist (2 years) will be at the Kitale Center, a second (2 years) will be associated with the mid-altitude areas of the country. Assistance from the latter will also be given to the

early maize program based on Katumani and the coastal program at Mtwapa.

An agronomist (4 years) will be associated with the mid-altitude program and will give support to agronomic research associated with the national maize program. In addition, some time will be devoted to regional maize and sorghum/millet adaptive testing and trials conducted in the more arid areas of Eastern Kenya. Emphasis of the adaptive research effort will gradually shift to sorghum/millet as the programs develop.

Special short-term training will be provided for scientific staff in experimental design, on-farm research, enhancing research quality, experimental methods, computer graphics, communicating science orally, manuscript preparation, proposal writing, research assessment and other areas deemed necessary to have a strong, self-motivated scientific staff. Other training in special aspects of seed technology, experimental techniques, and current advances in science will be provided through in-country training or consultants.

Opportunities for enhancing scientific proficiency will be available in terms of library facilities, publication policies and mechanisms, professional scientific meetings, and special seminars. Short-term consultants will be utilized when necessary to support in-country training. Special needs will be identified by Kenyan scientists in concert with the long-term technical assistants.

#### 4. Ranking of Criteria

Research on maize yield has been shown to be very cost effective (68% return in a recent Kenyan study), and has shown excellent economic returns. Maize is a commodity that is often grown locally for home consumption, thus it does not contribute to a great degree directly to employment. Indirectly, however, having a citizenry with a higher level of nutrition contributes to a healthier work force, and the higher income levels of farmers who sell maize allows them to make outside purchases.

There is potential to increase farmer incomes, especially in light of the rapid population increase and the growing need for maize and cereal grains nationally. Since maize is a staple crop, any increase in yield or decrease in risk of production has a major role to play in sustainability of agriculture and the economy. KARI has placed maize research as a top priority.

#### 5. Relationships With Other Components

The maize commodity component fits in well with the entire project. The effort is designed to utilize the improved management and

enhanced strength in scientific staff from Phase I. The program is ideally positioned to make major headway in Phase II.

The horticulture program will directly affect the maize program because most maize is grown in an inter-cropping system, usually with a horticultural crop. In addition to soil management and pest management experience the agronomists should have some common biological interests to complement the overall level of the science. Especially relevant will be the integration of research findings into more of a systems approach for on-farm trials and technology transfer.

Similarly, the small ruminant component will contribute mutually to the entire program. Use of animal manures, growing grain and fodder for animals will expand research options and emphasize the multi-disciplinary nature of the cropping problem.

The farming systems research approach will be particularly relevant, and will help minimize a major constraint, namely performing on-farm trials to help evaluate and transfer technology to the farmer. Awareness and continuing education on the socio-economic aspects of agricultural production and technology adoption are very critical to the persons doing the more biology-oriented research.

### III. Sorghum/Millet Component

#### A. Status of Sorghum/Millet Research

##### 1. Accomplishments

Breeding programs are currently being conducted on sorghum and pearl millet at Katumani and Kiboko, and for sorghum and finger millet at Kakamega and Alupe. Emphasis at all locations is on improving the genetic potential for yield, with programmatic leadership for the semi-arid areas coming from Katamani, and that for the more humid, striga-infected areas in Western Kenya coming from Kakamega. Primary breeding nurseries for sorghum and pearl millet are at Kiboko because of the low elevation, limited rainfall and capabilities for seed storage and irrigation.

The breeding programs are being complemented by agronomic studies and evaluation of breeding materials at Mtwapa, Embu, Lanet, Perkerra and Kisii. The overall goal of the research programs is to provide Kenyan farmers with the varieties and management technology to meet food and feed needs.

The role of national coordinator for the sorghum/millet program has been assumed by one of the long-term assistants along with a Kenyan

counterpart. The program is centered at Kakamega, but in reality is located in Nairobi with the long-term assistant. The national performance test for sorghum is operational and the one for millet was re-initiated in 1990. There have been significant findings among germplasm resources for sorghum and millet and agronomic and pest management contributions to the technology of these crops have been reported.

A group of scientists are in the process of getting advanced degrees in their discipline. The national coordinator has also organized the first national planning meeting that will occur in the near future. The recognition given to the sorghum/millet effort has helped raise awareness of the national role of cereals and a stronger source of pride among the scientists associated with these crops. Excellent working relationship have been established with ICRISAT, INTSORMIL and other International Organizations. The sorghum/millet program is positioned for significant progress in Phase II.

## 2. Deficiencies

Many of the general deficiencies for the sorghum/millet program are similar to those of the maize program. These would include inadequate operating expenses, administrative support and a lack of long- and short-range research planning. Procedures for varietal evaluation are developing, but it is not clear how varietal increase, seed increase and germplasm preservation will be handled.

Similar to maize, the general education level of the scientists is still at a low level. Special short courses, many in conjunction with maize, need to be conducted in-country, especially on topics such as biotechnology applications, experimental design, timeliness of operations, conduct of on-farm trials, publishing science and environmental safety. Opportunities for continuing scientist education via libraries and scientific meetings are also minimal.

Special consideration needs to be given to socio-economic aspects of sorghum/millet research, more so than for maize. Reasons for cereal preferences are not clear and marketing and processing technologies for sorghum/millet are lacking. Some of the advanced study and training may need to be in these directions.

## 3. Future Priorities

Many factors considered for maize and in the Phase I documents are also pertinent for sorghum/millet. Clearly, Kenya has a growing population that is sprawling eastward into agro-ecological areas of reduced crop production potential. The long-term solution will only be partially resolved by increasing yields per unit area of maize where it is adapted. The long-term strategy will require

alternate cereals, especially those adapted to areas that are too harsh for maize. Sorghum and millet offer that potential.

Sorghum and millets have more severe insect problems than maize, and bird damage is a major issue with light-hulled sorghum and pearl millet. Research may be able to alleviate many of these problems. Also, sorghum and millets can be processed into other foodstuffs for off-farm uses, perhaps substituted partially for wheat flour. To fully exploit the value of these crops there will need to be some marketing and processing research.

Future priorities for sorghum/millet need to focus on yield enhancement, lowered environmental risk, fewer insect and disease problems and improved marketing and processing technology. Agronomic research, including factors such as variety adaption, cultural practices, inter-cropping, pest control, fertility management, water management and tillage practices is essential to insure that the biological potential of improved varieties and hybrids is realized. Breeding and agronomy programs will closely coordinate activities to achieve this goal.

A major evaluation needs to be made comparing open-pollinated populations and hybrids of sorghum and millets to determine what balance of breeding strategies to use. Those experiments should be conducted as soon as possible in order to develop the long-range objective. All of this needs to be considered with reference to the long-term uses of the products and in concert with the national priority on research for the small land-holder.

#### 4. Constraints

During Phase I considerable progress was made in overcoming some of the organizational problems as the national programmatic effort was converted to a commodity basis. The scientific staff is being enhanced in training, but overall, the program growth is much slower and began later than it did for maize. In addition, there are four basic commodities involved and two dispersed geographic locations of major production. Further, the long-term technical assistant has been in place for only a year.

Finger millet and dark-hulled sorghum are grown in Southwest Kenya, whereas pearl millet and light-hulled sorghum are grown in Eastern Kenya. The environment and social conditions are also much different, which, in essence, cause efforts and objectives on these commodities to be more dispersed. This diversity, and the fewer scientists relative to maize, will cause research to progress at a slower rate. Thus, return on investment in sorghum/millet research may not have the same rate of return that maize enjoyed, but it is essential to solve the long-range food and economic security needs of Kenya.

Reasons for acceptance of sorghum and millet in the food supply need to be understood so the problems can be researched. Thus, during the technology assessment exercise for sorghum and millet some special consideration needs to be given to marketing and processing of these cereals, in addition to the biology and economics of production.

Many farmers in the dryer, more harsh climates where sorghum and millets are comparatively better adapted than maize are also operating at subsistence levels. Thus, technology and its transfer to farmers will need to be placed into a context of sustainability and low-input management. Many scientists coming back from training, similar to those for maize, will have low morale and be somewhat dismayed. Special efforts will be necessary to help them overcome the real and perceived deterrents to research productivity. Clear policies and procedures for disseminating scientific research information will need to be established.

A national coordinated program is not yet in place for the sorghum/millet commodity. There is good help with germplasm from International Centers and Organizations. Clear policies and procedures for timely evaluation and release of germplasm need to be established, along with a clearer understanding of the relationship between KARI and the Kenya Seed Company.

## B. Technical Feasibility of Expected Outputs for Sorghum/Millet

### 1. Component Purpose

Objectives during Phase I for the sorghum/millet program were similar to those for the maize program, except at a much lower level of input. The basic level of technology in Kenya and the number of scientists working on sorghum/millet are well below the levels for maize. Further, during Phase I the long-term technical assistance provided for sorghum/millet was less than for maize, and was the last position to be filled. This has caused the sorghum/millet program to progress scientifically at a slower pace than that for maize. Even so, an excellent start has been made, and with the learning experiences of the maize program being utilized, the progress should move along more quickly.

### 2. Identification of Expected Outputs

A clear understanding of the technology status of sorghum and millet will be the outcome of the in-depth assessment. Improved yield and broader adaptation of the crops will be realized by following the solid-based planning effort.



Similar to the program for maize, expected outputs of the sorghum/millet program will be a more mature thinking and self-confident research staff that is more closely linked to the international community and to the needs of the small farmer in Kenya. As the degree-training programs are reduced and the technical assistants are phased out the Kenyan scientists, through the national coordinator, specialist committee, and other programs will have the necessary leadership and implementation skills.

Better planned experiments designed to meet a regional or national mandate will be more timely and focused to give better quality data for more credible interpretation. The system of on-farm trials will help focus the specific objectives and give an assessment of research progress. This will facilitate better linkages with extension and other means of technology transfer.

Some additional M.Sc. and Ph.D. scientists will be available in strategic interest areas to augment the research and technology transfer efforts. Further, the entire staff will have more training and experience in computer operation, communication skills, proposal writing, and developing, implementing and reporting research findings.

Some mechanism for recognition and appraisal of science will be established. Scientists-to-scientist interactions to allow in-depth evaluation and scrutiny of research will be operational. This will include library resources, outlets for publication and opportunities for oral presentation of research results.

### 3. Activities to Achieve Output

Long-term technical assistance will be in the form of a cereal breeder and agronomist, probably persons with sorghum experience. None of the technical assistants will have an individual technical program. Rather, each will work closely with the Kenyan scientists and the national sorghum/millet coordinator to accomplish the national and regional objectives. Individuals will also serve as mentors for graduate students who are conducting thesis research in Kenya for their advanced degrees. Assistants will also facilitate re-entry of degree recipients into the scientific arena.

The breeder/agronomist (4 years) will be located at Nairobi and have responsibility for the major breeding programs. Assistance will be given to national coordination of the sorghum/millet research effort. An agronomist (4 years, the same position as described under the maize program due to shared responsibility) will give support to the national objectives in agronomic research. In addition, attention will be given to adaptive testing of sorghum and millet in trials conducted in arid and more lowland areas of Eastern Kenya. While both maize and sorghum/millet will have

initial emphasis, it is expected to shift more towards sorghum and millet as Phase II progresses.

Special short-term training, probably in conjunction with the maize program, will be provided for scientific staff and technical officers in experimental design, on-farm research, enhancing research quality, experimental methods, computer graphics, communicating science orally, manuscript preparation, proposal writing, research assessment and other areas deemed necessary to have a strong, self-motivated scientific staff. Other training in special aspects of seed technology, experimental techniques and current advances in science will be provided through in-country training or consultants.

Opportunities for enhancing scientific proficiency will be available in terms of library facilities, publication policies and mechanisms, professional scientific meetings and special seminars. Short-term consultants will be utilized when necessary to support in-country training. Special needs will be identified by Kenyan scientists in concert with the long-term technical assistants.

#### 4. Ranking of Criteria

Research on sorghum and millet has lead to steady increases in crop yield, but it is more difficult to define because these crops are often grown in harsh environments. Light-hulled sorghum is a commodity that is often grown locally for home consumption, thus does not contribute to a great degree directly to employment. In that sense, however, it contributes a more stable food source than most other cereal crops. Conversely, dark-hulled sorghum needs to be partially processed to remove tannins before it is consumed by humans. The tannins do give the sorghum some bird resistance, however, which decreases the cost of production. These sorghums offer a good potential for feed and processed food manufacturing. Farmers who are able to sell a crop such as sorghum benefit directly, and it allows them to make outside purchases.

There is good potential to increase farmer incomes, especially in light of the rapid population increase and the growing need for cereal grains nationally. Since maize is a staple crop, any increase in yield of other cereals or decrease in national risk of production has a major role to play in sustainability. KARI has placed research on maize, sorghum and millet as a top priority.

#### 5. Relationships With Other Components

The sorghum/millet commodity component fits in well with the entire project. The effort is designed to utilize the improved management and enhanced strength in scientific staff from Phase I. The program is ideally positioned to make major headway in Phase II.

The horticulture program will directly affect the sorghum/millet program because most sorghum and millet is grown in an inter-cropping system, usually with a horticultural crop. In addition to soil management and pest management experience gained through horticulture research, the agronomists and horticulturalists should have some common biological interests to complement the overall level of the science. Especially relevant will be the integration of research findings into more of a systems approach for on-farm trials and technology transfer.

Similarly, the small ruminant component will contribute mutually to the entire program. Use of animal manures, growing grain and fodder for animals will expand research options and the multi-disciplinary nature of the cropping problem.

The farming systems research approach will be particularly relevant, and will help minimize a major constraint, namely helping with on-farm trials and transfer of technology to the farmer. Awareness and continuing education on the socio-economic aspects of agricultural production and technology adoption are very critical to the persons doing the more biology-oriented research.

#### IV. Position Descriptions

##### A. Breeder/Agronomist (2)

###### 1. Qualifications

Ph.D. in plant breeding, preferably in maize or sorghum with a minimum of 5 years experience in a tropical or subtropical region, Africa preferred, or at an International Agricultural Research Center, or 5 years experience as an applied breeder. Experience should include demonstrated ability to plan and execute a significant breeding program with a strong field application. Demonstrated appreciation of on-farm research and broad understanding of agronomy and pest management are needed. Experience in research project planning, management and implementation is essential. Demonstrated ability and willingness to develop and implement an interdisciplinary research team is essential. Willingness to live and perform in areas outside major metropolitan areas is necessary.

###### 2. Duties and Responsibilities

- o Assist Kenyan scientists in preparing long-term and short-term breeding plans in consultation with the National Commodity Coordinators;

- o Assist national coordinators in developing an integrated multi-disciplinary cereal improvement program involving breeders, agronomists, pathologists, and entomologists so as to expedite release high yielding, widely adapted, disease and insect resistant materials;
- o Assist in re-entry of professional research officers from Kenya who are returning from graduate training;
- o Help evaluate germplasm, conduct national variety evaluation trials, develop new varieties and hybrids, and recommend varieties and/or hybrids for release to small farmers in Kenya;
- o Assist with the preparation of research publications on plant breeding and agronomic research;
- o Ensure proper maintenance and use of equipment provided under the project.
- o Respond to recommendations from agronomists, pathologists, entomologists and socio-economists on research priorities.
- o Assist Kenyan cereal researchers, as appropriate, in designing and implementing adaptive research and demonstration trials on farmers fields;
- o Provide liaison between the special short-term consultants and the professional and administrative officers of the National Programs;
- o Assist in identification and selection of Kenyan agricultural scientists for long-term training or short-term training, as appropriate, and assist in selection of training institutions;
- o Assist with short courses or other types of in-service training for counterparts, extension workers and other GOK personnel in cereal agriculture, including development of curricula, course materials and presentation;
- o Where appropriate and desirable, serve in a graduate committee/advisor capacity for M.Sc. and/or Ph.D. candidates who are conducting their thesis research in Kenya.

## B. Agronomist (2)

### 1. Qualifications

Individual will possess a Ph.D in Agronomy with emphasis on field crop production or field-oriented soil science, with a minimum of

- o Assist national coordinators in developing an integrated multi-disciplinary cereal improvement program involving breeders, agronomists, pathologists, and entomologists so as to expedite release high yielding, widely adapted, disease and insect resistant materials;
- o Assist in re-entry of professional research officers from Kenya who are returning from graduate training;
- o Help evaluate germplasm, conduct national variety evaluation trials, develop new varieties and hybrids, and recommend varieties and/or hybrids for release to small farmers in Kenya;
- o Assist with the preparation of research publications on plant breeding and agronomic research;
- o Ensure proper maintenance and use of equipment provided under the project.
- o Respond to recommendations from agronomists, pathologists, entomologists and socio-economists on research priorities.
- o Assist Kenyan cereal researchers, as appropriate, in designing and implementing adaptive research and demonstration trials on farmers fields;
- o Provide liaison between the special short-term consultants and the professional and administrative officers of the National Programs;
- o Assist in identification and selection of Kenyan agricultural scientists for long-term training or short-term training, as appropriate, and assist in selection of training institutions;
- o Assist with short courses or other types of in-service training for counterparts, extension workers and other GOK personnel in cereal agriculture, including development of curricula, course materials and presentation;
- o Where appropriate and desirable, serve in a graduate committee/advisor capacity for M.Sc. and/or Ph.D. candidates who are conducting their thesis research in Kenya.

## B. Agronomist (2)

### 1. Qualifications

Individual will possess a Ph.D in Agronomy with emphasis on field crop production or field-oriented soil science, with a minimum of 5 years of experience. Research planning, management and implementation of projects is an essential activity. Experience as

an extension agronomist with a joint research appointment would be highly desirable.

The candidate must be committed to working in the developing world, with 5 years of field experience in a developing country. Demonstrated ability and willingness to develop and work with scientists from other countries and with a multi-disciplinary team are essential. Willingness to live and perform in areas outside major metropolitan areas are necessary. Experience in farming systems research or as a member of multi-disciplinary team carrying out on-farm research is essential.

## 2. Duties and Responsibilities

- o Assist with research in progress and implementation of new research activities designed to address constraints to increased cereal production by small farmers.
- o Provide guidance for conduct of field trials and on-farm tests.
- o Maintain close linkages with the National Commodity Research teams and Regional Research teams.
- o Advise and obtain feedback from Research Extension Liaison Officers on matters relating to the extension of research findings.
- o Assist with interpretation of research results for administrators and policy makers through seminars, workshops and publications.
- o Assist with the preparation of agronomic portions of research publications.
- o Assure proper use and maintenance of equipment provided by the program.
- o Provide liaison between special short-term consultants and the professional and administrative officers of the National Program.
- o Assist in identification and selection of Kenya agricultural scientists for long-term training, in-country, or short-term training as appropriate.
- o Where desirable or appropriate serve in a graduate committee/advisor capacity for M.Sc. and/or Ph.D. candidates conducting their thesis research within Kenya.
- o Assist Kenyan scientists during re-entry into the professional environment after they return from advanced training.

## Technical Analysis - Horticulture Sub-Component

### I. Background

#### A. Rationale for USAID Assistance

USAID assistance to the horticulture commodity program follows the same rationale as have been developed for maize and sorghum/millet. Specific rationales are as follows:

- o export horticultural crops are given a high priority by the GOK,
- o further development of a horticulture commodity program is consistent the Agricultural Development strategy, and
- o expansion of the horticultural industries meets Kenya's need for expansion of export crops to obtain foreign exchange, while continuing to meet the countries food security issues.

The GOK and USAID have as a goal in the agricultural sector of Kenya the mission to sustain growth and enhance food security through self-reliance. Clearly, there is great potential for the further development of horticultural crops to meet several national objectives through expanded production. Although cereal crops will for the foreseeable future remain the food staple of the farmers, horticultural crops will add measurably to the health and well-being of the population. This objective can be enhanced through the further development of horticultural crops, which:

- o are high value and lend themselves to an economy faced with a shortage of arable lands;
- o return a high level of foreign exchange;
- o expand employment opportunities to absorb an increasing labor force, with high rates of economic return; and,
- o are well suited to the small landowner in a wide array of agro-climatic zones, adding an important element to the household food security issue.

Total export values for fresh fruit, vegetables and cut flowers has risen significantly in the period, 1987-1990. Figures for 1990 indicate that the total export value for these crops exceeded 1.678 trillion Ksh. Cut flower exports accounted for approximately 51% of this market in 1990, or 865 M Ksh , up from 502 M Ksh in 1987.

Exports of French beans have risen in value from 175 M Ksh in 1987 or 19 % of the market share to 424 M Ksh in 1990, equivalent to 25 % of the market. In U.S. dollars this level of export volume is equivalent to \$64.5 M for 1990.

The three year increase in exports of horticultural crops is 83.7%, and in discussions with the Managing Director of HCDA, there is every indication that with resolution of the constraints that have been identified, this rate of growth can be sustained. For the period 1989 to 1990, the rate of growth was 16.6%, and if this level of growth in the export markets was sustained over the next three year period, growth would exceed 45%.

Additionally, this emphasis on strengthening the horticultural sector is consistent with the mandate given to the Horticultural Crops Development Authority (HCDA) in 1967. The HCDA has the responsibility to regulate the industry through the licensing of exporters, providing an advisory service to the industry, gather market intelligence and organize farmer groups to assist with grading specifications, storage, collection, transportation and warehousing of produce. HCDA also monitors foreign prices, assists with limited marketing for small scale farmers and finances projects within the horticultural sector.

EXPORT VALUE FOR FRESH FRUIT, VEGETABLES AND CUT FLOWERS  
(1987-1990)

Commodity	Export value in Ksh, (000,000)			
	1987	1988	1989	1990
Cut Flowers, Ksh	502	634	728	865
%	(54.9)	(47.2)	(50.5)	(51.5)
French Beans, Ksh	175	264	350	424
%	(19.2)	(19.9)	(24.3)	(25.4)
TOTALS (all exports), Ksh	913	1327	1440	1678

B. Consistency with USAID/Kenya Strategy

One of the objectives of USAID/Kenya's Agricultural Development Strategy is to enhance foreign exchange capacity. Clearly exports of horticultural crops, including cut flowers meets this objective. Kenya has a unique opportunity to meet growing demand for fresh fruit and vegetables, along with fresh floral crops in European,



Asian and Middle Eastern markets when supplies are in short supply. Kenya's unique climate and environment allows it to produce vast quantities and an unusual array of products to meet market demand. Products which are not exported can fill gaps in the domestic food supply. The objective of increasing Kenya's export of horticultural crops is consistent with the national agricultural development strategy in that it is national in scope, focuses on intensive cultivation of the land and will emphasize small-farmer participation.

C. Promotes Management Objectives of National Agricultural Research Project

The purpose of USAID's project is to develop a well-managed agricultural research system capable of providing the agricultural sector with the latest technologies which will increase production on a continuing basis. The effort proposed in the horticultural segment of Phase II of the project will add to the increased productivity of the nation's agriculture. Adding to the capacity to conduct horticultural research by increasing the level and number of scientist trained to conduct these efforts, adaptive programs using a farming systems approach can be taken to farmers with a reasonable degree of success.

D. Minimal Management Burden

The programs proposed to expand the technical assistance and training in the area of horticulture do not add to the burden of USAID or the GOK. Support of these programs should have a net positive return to the GOK and to KARI as the export market of fresh fruits, vegetables and floral crops increases. Without a effort of this type, Kenya risks losing market share to its competitors who are only to eager to take it's place in the market. Through a program of research Kenya can meet the research needs that will keep these markets viable and growing.

II. Status of Research on Horticultural Crops

A. Accomplishments

Horticultural crops have received only minimal attention, as KARI has had as a priority and rightfully so, the need to address the larger issue of feeding a large and heavily populated nation. These issues of food security take precedence, however, in terms of export value, Kenya's horticultural crops offer unique opportunities for growth.

To date, most research on Horticultural crops has been limited to cultivar evaluations, spacing, fertility and management studies in an attempt to expand the scope of crops grown. Work on horticultural crops is underway at the KARI station at Thika, on breeding of french and dry beans for yield improvement and disease resistance. Screening varieties for virus resistance continues on beans to select cultivars that could be used in the breeding and improvement program. Evaluations are underway to assess the potential for new strawberry cultivars that will meet the growing in-country and export demands for this high value crop. Experimentation is underway on various cultural aspects of production, including propagation, spacing, fertility and time of planting studies to meet expected market demands. Additionally various tree fruit, both temperate and exotic, are being evaluated for adaptability under Kenyan conditions. These include preliminary evaluations with apples, avocados and mango at the Thika station.

The horticultural industries have developed into significant export crops in Kenya, despite very limited inputs from the research community - KARI. Producers have depended upon each other to the degree possible, HCDA, and on European and American technologies where and when available to solve problems associated with their industries.

Specific shortcomings are apparent in the horticultural programs including the following:

- o the near absence of any systematic evaluation of publicly available germplasm ( varieties, cultivars and clones) adoptable to Kenyan conditions.
- o lack of research and technology on handling, storage, transportation and marketing of horticultural crops.
- o underfunded efforts in research and few trained horticulturists with knowledge of the vast areas covered by this group of crops.

#### B. Future priorities

For all of the horticultural crops, it is evident that the GOK views them as vital in its efforts to assist in an expansion of export markets for Kenya products. These crops had an export value of 1.678 Billion Ksh, in 1990 and are expected to continue to expand if the constraints to their production and marketing can be overcome. The annual rate of growth for these industries has been estimated to be near 20 % annually. This rate of growth can be sustained, however it will require substantial inputs, many in the form of trained scientists to conduct adaptive research that will

provide this industry with the kind of information required to be competitive in the world market place.

For all of the horticultural crops, tree fruit, both temperate and exotic, fresh and processing vegetables and cut flowers, this will require variety/cultivar evaluations to be conducted over a period of years by trained horticulturists to evaluate this material for the many agro-climatic conditions of Kenya, production studies, to include spacing requirements, fertility, tillage, irrigation schedules, pest control ( insects, diseases, and weed control) and economic and market analyses. Additionally, as Kenya's horticultural crops increase in production and value in the market places in the world, it will be important to consider plant breeding programs on specific high value crops to develop cultivars specifically suitable for the micro climates that exist in Kenya.

Kenya's horticultural industry can not continue to grow at its present rate unless sound, on-site, adaptive research is provided on a larger scale, as the industry has few places to turn for information and guidance on the latest technologies. Without an effort of this nature it could mean a loss in market share to competitors. Once market share is lost, it will be extremely difficult to regain entry into the market place.

### C. Constraints

To mount a successful program of horticultural crop research there are several constraints that need to be addressed.

- o The development of a well trained scientific staff, including several individuals at the Ph.D. level in the various disciplines of horticulture, including post harvest physiology with an emphasis on storage and keeping quality of horticultural products, floriculture production and management, pomology ( both temperate and tropical fruit management and production) , vegetable crops production and management, vegetable crops evaluation, and a agricultural economist with interest in and knowledge of horticultural crop production and marketing to expand and model the industry.
- o Horticultural research is costly in terms of labor and it will require that an adequate operational expense allocation be appropriated. Flexibility in budgeting and management will be required if trained scientists are not to be frustrated ( and then as a consequence go to the private sector).
- o A national planning and priority setting effort needs to be organized so that research can be directed on a priority basis.
- o Establishment of a National Horticultural Crops Research Committee similar to that which has been so effective in the

area of Maize needs to be established. It should meet at a minimum, annually to discuss current research as part of a technology transfer process, and to discuss plans for future research and cooperation.

- o The lack of high quality seed is inhibiting further development of the vegetable crop industry. Most seed is imported with little or no local production. Local production of vegetable seed is limited by the technologies needed to increase production in a day-neutral climate. Additionally, seed obtained off-shore often has either low germination rates or is not true-to-type.
- o Lack of adequate fruit tree nurseries which can produce an adequate number of plants certified true-to-type.
- o The infrequent use of pesticides, fungicides and fertilizer leads to poor yields and poor quality products, unsuitable for the export market. This results from a lack of financial input, limited farmer knowledge and skill and ineffectual extension efforts.
- o The lack of suitable credit opportunities for farmers to obtain financing for inputs, forcing farmers to limit their expansion into higher valued crops
- o To further strengthen the planning process and to insure that sufficient funds are available for research, a process of assessing export crops with a system of market orders should be established. A portion of the fund derived from a market order should be directed to research on those crops that generated the funds. These funds should be made available on a competitive basis with the researchers preparing proposals in response to an RFP that meet a national priority need established by the industry and KARI.

### III. TECHNICAL FEASIBILITY OF EXPECTED OUTPUTS.

The revised scope of this project is to develop a well-managed agricultural research system capable of providing the agricultural sector with the appropriate level of horticultural technology that will increase and sustain production of these export crops and meet in-country needs. The objective of the horticultural component of the project has 3 dimensions: to improve the level of the research need to provide to horticultural crop producers in Kenya the information required to succeed in a highly competitive market place where the latest technologies are critical, to increase the capacity of Kenyan scientists to train students to manage these complex industries and to provide small farmers with the adaptive technologies to increase their production.

The output of this phase of the project will be a national system of priority setting and addressing the needs of the horticultural industry through adaptive research and technology transfer. Through research programs at KARI and the Universities, horticultural crops and technologies will be identified that will allow farmers the opportunity to adapt and modify their farming system.

Long-term assistance in the form a horticulturist will provide the framework for assisting KARI establish a well structured program in horticultural research. The long-term TA should be located in Nairobi, however it will be required that this individual travel extensively to evaluate and assist with the horticultural effort at all KARI stations. Of immediate importance will be the evaluation of the need to have horticulturist at all KARI stations or at major centers. The long-term TA should also lay out the efforts expected of the short-term TA's so they can be more effective in the short periods of time they will be in-country.

#### IV. Position Descriptions

##### A. HORTICULTURIST

###### 1. Qualifications

The individual will possess a Ph.D. degree in horticulture or related discipline with emphasis on vegetable and/or fruit crop production and have a minimum of 10 years experience. Research project planning, management and implementation experience is essential. Individual must have a broad experience in horticultural crop production, management and marketing systems. Experience in some aspect of technology transfer is highly desirable.

The candidate must be committed to working in the developing world, preferably with experience in Africa. Demonstrated ability and willingness to provide advise, council and actively work with scientists from other countries and with a multi-disciplinary FSR&E team approach is essential.

###### 2. Duties and Responsibilities

- o Provide guidelines and leadership for the establishment and implementation of a National program planning and priority setting process for horticultural research.
- o Provide guidance to scientists designing and conducting field trials and tests on cultivar and/or clonal evaluations of

fruit and/or vegetable crops to find adaptable material for Kenya.

- o Provide guidance to research scientists in establishing protocols for the collection of timely and meaningful data.
- o Assist in the process of establishing linkages with the regional research teams addressing horticultural issues.
- o Assist in the interpretation of results for administration and policy makers through seminars, workshops and publications.
- o Assist in the process of identifying the short term TA needs in conjunction with the Assistant Director of Horticultural Research.
- o Assist with the preparation of horticultural research and technology transfer publications.
- o Provide a liaison effort between the short term TA's and the professional and administrative officers of KARI.
- o Assist in the development of linkages between the commodity groups (yet to be established) and KARI.
- o Assist in the selection of Kenyan scientists for long term training.
- o Where applicable serve as a graduate advisor or committee member for MSc. and Ph.D. candidates selected for long-term training as part of the national program.
- o Assist with strengthening linkages to the International Agricultural Centers and to the in-country universities.

B. HORTICULTURISTS: TREE FRUIT, VEGETABLE CROPS AND/OR POST HARVEST TECHNOLOGY

1. Qualifications

Individuals must hold a Ph.D. degree in horticulture or related discipline with emphasis on vegetable crop management and culture, fruit crop production and/or post harvest physiology/technology and have a minimum of 10 years experience. Research project planning, management and implementation experience is essential. Individuals must have a broad experience in horticultural crop production, management, post harvest technologies and marketing systems. Experience in some aspect of technology transfer is essential.

The candidates must be committed to working in the developing world, preferably with experience in Africa. Demonstrated ability and willingness to provide advise, council and actively work with scientists from other countries and with a multi-disciplinary FSR&E team approach is essential.

## 2. Duties and Responsibilities

- o Participate in a national horticultural crops planning and priority setting process.
- o Provide guidance to scientists designing and conducting field trials and tests on cultivar and /or clonal evaluations of fruit and/or vegetable crops to find adaptable material for Kenya.
- o Provide Kenyan scientists and producers with the latest in post harvest technologies in order that losses of perishable commodities are reduced.
- o Provide guidance to research scientists in establishing protocols for the collection of timely and meaningful data.
- o Assist in the process of establishing linkages with the regional research teams addressing horticultural issues.
- o Assist in the interpretation of results of horticultural research for administration and policy makers through seminars, workshops and publications.
- o Assist in the process of identifying the short term TA needs in conjunction with the Assistant Director of Horticultural Research, MIAC Team Leader and other TA's.
- o Assist with the preparation of horticultural research and other publications to aid in the process of technology transfer.
- o Assist in the development of linkages between the commodity groups (yet to be established) and KARI.
- o Assist in the selection of Kenyan scientists for long-term training.
- o Where applicable serve as a graduate advisor or committee member for MSc. and Ph.D. candidates selected for long-term training as part of the national program.
- o Assist with strengthening linkages to the International Agricultural Centers and to the in-country universities.

**Technical Analysis update - Agricultural Research Fund**

**I. Rationale**

The statement in the original project paper for the Research Fund continues to be valid.

There is an even stronger rationale for the contract Research component which will be initiated in Phase II. It will obviously increase KARI/private sector cooperation. The contracts with private sector firms will increase the resources available to KARI to assist with solving Kenyan Agricultural problem. Assuming that the research produces tangible results, the capacity of the private sector firms will be increased to the end that employment and income will be increased. Still an added advantage is that the firm paying for the research will likely readily adopt the new technologies.

If the industry is at all competitive, other firms will seek to secure and use the technology. The previous sentence underscores the importance of the statement in the PP that KARI, as part of its planning for implementation, develop policies on who owns the research output and for how long does the sponsor have exclusive rights. Determining intellectual property rights is of concern to KARI, the private firm and the individual scientists involved.

**II. Focus**

The single activity in the original project paper was the Research Fund which called for achieving the objectives through two "windows". One was small "contracts" with scientists in the Universities and private sector who have been invited to submit proposals on subjects where KARI needs external assistance. The second window was "grants" to fund unsolicited innovative proposals a third activity was funding training for private sector scientists.

As the fund has been implemented, both windows have been announced. A contract document is being used to implement both windows. This decision was made after discussions on the best means of insuring researcher and institutional accountability.

Most of this effort in Phase I has been devoted to the supplemental research needs of KARI. The primary reason was the difficulty of evaluating "innovative" proposals. The problem was stressed in the original technical analysis.



In Phase II both windows will be used; but as procedures for the supplemental research projects are perfected, additional attention will be given to "innovative proposals".

In Phase II a new initiative will be started - private sector firms contracting with KARI to do specific research. This will be labeled contract research.

### III. Institutional Home

There was lengthy discussion in the technical analysis section of the original PP about where the Research Fund would be located within the GOK. The recommendation was that the Research Fund be a discrete unit within KARI reporting to the Deputy Director for finance and management.

The office of Secretariat has been established as a discrete entity within KARI reporting to the KARI Board of Management through the Director of KARI. Policy direction for the fund comes from a committee of Scientists from Universities and the private sectors named by the Director of KARI. The arrangement appears satisfactory and will be continued in Phase II.

### IV. Fund Administration

Most of the items in this section of the original technical analysis have been considered as the Research Fund was implemented and are still valid. One significant change in emphasis was placing greater importance on peer review of proposals. As greater emphasis is placed on funding innovative proposals, statements in the original technical analysis on criteria for selection and ensuring accountability should be considered.

The administration of "contract research" as defined above has a completely different set of problems from the Research Fund. One major one is that KARI will be soliciting (not giving) contracts. A second major difference is that KARI will be responsible for doing the research work within KARI vis a vis monitoring outside contractors in the Research Fund activities.

The administration of the Research Fund and contract research are related in several ways. KARI has two options for managing the contract research activities. It can become a second function of the office of Secretariat of the Research Fund with the name changed to "Office of Secretariat of the Research Fund and Manager of Contract Research". A second option is to establish a new unit for contract research and have it report to the Deputy Director for administration. The Director of KARI who knows his personnel and resources available is the person in the best position to make this decision.

## V. Staffing

The Office of Secretariat for the Research Fund has been staffed with competent persons and is operational. It is recognized that means must be founded in the near future for implementing the monitoring and evaluation goals the ARF has established for itself. Unless the volume of activity of the Research Fund is accelerated much more rapidly than anticipated at this time, it does not appear feasible for the office of secretariat to add a full time monitoring and evaluation officer as suggested in the original technical analysis. This is particularly true because the Secretariat has good qualification to at least guide the monitoring and evaluation work.

Administering the Contract Research person will require a person with somewhat different qualifications than the Secretariat. The essential requirement is knowing how to get work done within KARI and maintaining accountability within KARI. Both the Research Fund and contract research need assistance from a trained fund raiser.

## VI. Technical Assistance and Training

Three months of technical assistance (one third of the amount budgeted) was used to help create and operationalize the Research Fund. Additional short-term technical assistance will be needed to create a Contract Research program. If an endowment is created, legal help from within Kenya will also be required. Both the fund and contract research programs will benefit from short-term TA on "fund raising". A limited amount of short-term TA will be needed to assist in monitoring and evaluating both activities. Short-term (non-degree) training in the U.S. is needed for the contract research administrator and for the person who will promote the ARF and contract research and plan a marketing (fund raising) program. In addition support will be given to the development of promotional materials for the ARF and the contract/grants program.

## VII. Private Sector Training

The original PP and technical analysis stated that the Research Fund would or could fund non-degree training for scientists in the private sector. Nothing has been done or even planned for the activity.

It is recommended that efforts to implement this activity in phase II be limited to assisting private sector scientists find and enroll in appropriate training situations with the cost paid for by the private sector for the following reasons:

- o KARI capacity will be pressed to fully implement the Research Fund and Contract Research Fund components;
- o funds will be very limited;
- o Starting a training component will require a completely different set of policies and procedures. In the US the NSF, NIH and similar organizations have completely different units for handling training and research grants/contracts.

#### VIII. Capacity of KARI

KARI has the capability of developing and operationalizing the administration of the ARF and contract research with a small amount of short term TA and short term training. The personnel required are available within KARI.

KARI does have limited capacity at this time to complete the terms of contracts it may be offered. Hence one of the major criteria for deciding on whether to accept a contract is the capacity of KARI to conduct the research.

#### IX. Sustainability

KARI can sustain the Research Fund and contract Research efforts provided there is a well planned and continuous fund raising effort. Both the Research Fund and contract Research can be made attractive but few donors/contracts will step forward and participate without being asked.

#### X. Administration Arrangements

The administrative unit for the Research Fund is operational and no change is planned.

The arrangement is a Secretariat who reports to the KARI Board of Management through the Director of KARI and advice on policy matters is given by a committee of scientists from the University and private sector. All the staff is currently being paid by KARI.

For contract/grant research, KARI will need to determine the appropriate organizational "home" for this function and assign staff to the office so that it can be functional. The Director of KARI may want to utilize a consultant to assist with the design of a scheme for a contract/grant office.

## LOGICAL FRAMEWORK: NATIONAL AGRICULTURAL RESEARCH II (615-0229)

NARRATIVE SUMMARY GOAL:	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
To increase Kenya's national food security through increased agricultural productivity, especially in the smallholder sector.	<p>1. Ag sector value added increased by 4% annually.</p> <p>2. Food crop yields increased.</p> <p>3. On-farm profits increased by 4% annually.</p>	<p>MOALD/CBS production statistics.</p> <p>Local market prices.</p> <p>PAM studies/survey of representative farms.</p>	<p>GOK will continue policies to assure positive incentives for ag production.</p> <p>External factors will support increased growth in the ag sector.</p> <p>The extension system is an effective system for delivering technology to the farmer.</p>
PURPOSE:	EOPS	MEANS OF VERIFICATION	ASSUMPTIONS
To develop a well-managed national agricultural research system providing the ag sector with appropriate technologies which will increase productivity on a continuing basis.	<p>1. Budgets and resources allocated in accordance with national priorities and productivity of research units.</p> <p>2. Annual release of new technology recommendations for maize, sorghum/millet, horticulture and small ruminants.</p> <p>3. An applied farming systems research system in place.</p> <p>4. KARI staff functioning effectively in research and administration.</p>	<p>KARI budgets, financial and annual reports.</p> <p>Evaluation of research programs.</p> <p>Materials transferred to seed companies.</p> <p>Evaluation of extension materials.</p>	<p>GOK will provide financial support and commitment and KARI revenues from commercial research will increase as necessary to maintain research programs and retain staff and a farming systems approach.</p> <p>Linkages between research and extension programs can be strengthened to improve the effectiveness of the commodity research programs.</p>

OUTPUTS:	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
1. Strengthened ag research planning, administration and management systems.	1a. Personnel management systems in place. 1b. M&E systems in place for five commodity research programs. 1c. Budgets allocated according to a research prioritization plan. 1d. Impact assessments completed for research done on three major problem areas.	KARI budgets, financial and annual reports.  Evaluations.  Review of impact assessments.	GOK will have sufficient commitment to improved management to implement needed changes.  Qualified Kenyan personnel are available for key positions.
2. Improved farmer usable technologies developed for maize, sorghum and millet, horticultural crops and small ruminants.	2a. Three new varieties of maize developed and tested for two agro-ecological zones. 2b. Six to eight varieties of sorghum and millet tested for two agro-ecological zones. 2c. Evaluation of improved germplasm of two to three major vegetable crop groups to select materials and varieties that are adaptable to Kenya's varied agro-ecological zones. 2d. A new breed of goat which can provide meat and milk for limited resource farmers developed to the point of commercialization.	KARI annual reports.  Evaluations.	Genetic material exists which can be adapted to produce crop varieties appropriate to the Kenyan on-farm environment.

3. Operating Ag Research Fund supporting research activities undertaken by the private sector and the academic community.	3a. Other sources of support for the ARF match or exceed project contributions. 3b. Operational M&E plan for individual grants. 3c. 75% of research grants completed on schedule.	KARI M&E and annual reports.  Evaluations.	
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INPUTS:	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
Technical Assistance	\$5,748,000 (192 pm long-term, 87 pm short-term)	MIAC reports.	Qualified candidates are available.
Training	\$3,727,000 (12 PhD, 17 MS)	MIAC, KARI reports.	
Commodities	\$1,366,000	MIAC, KARI, USAID reports.	
Operational Support	\$1,216,000	KARI, GOK budgets and financial reports.	
Research Fund	\$350,000	KARI reports.	
Evaluation/Audit	\$250,000	USAID reports.	
Administration	\$2,093,000	MIAC reports.	

# DETAILED COST ESTIMATES

ANNEX J

## RESEARCH PLANNING & MANAGEMENT

	YEARS					
	1	2	3	4	5	TOTAL
<b>Technical Assistance</b>						
	*					
Research management Ad	6,940	237,036	264,294	294,101	289,433	1,091,804
M&E Specialist	40,378	63,303	66,165	0	0	169,846
M&E Consultant	0	0	0	23,052	24,095	47,147
Info/comm consultants	20,189	21,101	22,055	0	0	63,345
Planning and Mgmt.consult	20,189	21,101	0	23,052	24,095	88,437
Admin. systems support	120,000	240,000	200,000	100,000	90,000	750,000
Sub-total	207,696	582,541	552,514	440,205	427,623	2,210,579
<b>Participant Training</b>						
PhD Ag Economics	13,049	27,402	31,621	35,275	18,393	125,740
MS Socio-Economics	0	13,701	31,621	35,275	16,918	97,515
MS Communications	0	13,701	31,621	35,275	16,919	97,516
Management study tours	0	17,726	0	19,172	20,737	57,635
Internships MIS/ResMgmt	0	9,496	0	9,496	9,496	28,488
Internships Agr.Info	0	0	9,496	9,496	9,496	28,488
MIS/M&E workshops	0	0	8,863	17,726	17,726	44,315
Publication workshops	8,863	8,863	8,863	8,863	8,863	44,315
Proposal writing wrkshop	8,863	8,863	0	8,863	8,863	35,452
Station mgmt workshops	0	8,863	8,863	8,863	8,863	35,452
Special Technical Trn.	0	0	0	50,000	50,000	100,000
Sub-Total	30,775	108,615	130,948	238,304	186,274	694,916
<b>Operational Funds</b>	0	0	0	0	0	0
<b>Commodities</b>						
TA vehicles	0	20,000	0	0	0	20,000
TA furn/appliances	0	2,500	2,500	0	0	5,000
Equipment	5,000	10,000	10,000	15,000	20,000	60,000
Sub-total	5,000	32,500	12,500	15,000	20,000	85,000
<b>TOTAL</b>	<b>243,471</b>	<b>723,656</b>	<b>695,962</b>	<b>693,509</b>	<b>633,897</b>	<b>2,990,495</b>

\* Note: An additional \$250,000 of first year costs are funded from Phase I.

## MAIZE COMPONENT

	YEARS					
	1	2	3	4	5	TOTAL
<b>Technical assistance</b>						
Maize breeder 24mo	196,697	221,398	0	0	0	418,095
Systems agronomist 48mo	0	194,100	186,791	196,130	205,937	782,958
Maize consultants	44,110	44,110	61,226	63,972	44,561	257,979
Sub-Total	240,807	459,608	248,017	260,102	250,498	1,459,032
<b>Participant Training</b>						
PhD Ag Entomology	13,049	27,402	31,621	35,275	18,393	125,740
PhD Agronomy	13,049	27,402	31,621	35,275	18,393	125,740
MS Agronomy (US)	0	54,804	115,088	130,972	0	300,864
MS Ag Econ (US)	0	13,701	28,772	32,743	0	75,216
Farming systems wrkshp	8,863	8,863	8,863	8,863	8,863	44,315
Maize workshops	0	8,863	0	8,863	8,863	26,589
CMRT training program	47,000	48,000	49,000	50,000	52,000	246,000
Visiting scientists	0	0	10,532	10,953	11,391	32,876
Sub-Total	81,961	189,035	275,497	312,944	117,903	977,340
<b>Operational Funds</b>	0	0	135,000	145,000	155,000	435,000
<b>Commodities</b>						
TA vehicles	20,000	0	0	0	0	20,000
KARI vehicles	40,000	0	40,000	0	0	80,000
TA furn/appliances	0	5,000	0	0	0	5,000
Research equipment	50,000	50,000	50,000	75,000	20,000	245,000
Sub-Total	110,000	55,000	90,000	75,000	20,000	350,000
<b>Total</b>	<b>432,768</b>	<b>703,643</b>	<b>748,514</b>	<b>793,046</b>	<b>543,401</b>	<b>3,221,372</b>



## SORGHUM/MILLET COMPONENT

	YEARS					
	1	2	3	4	5	TOTAL
<b>Technical Assistance</b>						
Sorg./millet breeder 24mo	181,117	218,697	0	0	0	399,814
Systems Agronomist	0	0	0	0	0	0
Sorghum/Millet Consult.	39,067	61,226	61,226	61,226	39,067	261,812
<b>Sub-Total</b>	<b>220,184</b>	<b>279,923</b>	<b>61,226</b>	<b>61,226</b>	<b>39,067</b>	<b>661,626</b>
<b>Participant Training</b>						
PhD Ag Breeding	13,049	27,402	31,621	35,275	18,393	125,740
PhD Agronomy	26,097	54,804	63,242	70,550	36,786	251,479
MS Agronomy (US)	0	27,402	57,544	65,486	0	150,432
MS Agronomy (US)	0	0	31,621	35,275	18,393	85,289
Sorghum/millet wrkshp	8,863	8,863	0	8,863	8,863	35,452
Farming Systems wrkshp	0	8,863	8,863	8,863	8,863	35,452
Visiting Scientists	0	0	0	10,953	11,391	22,344
<b>Sub-Total</b>	<b>48,009</b>	<b>127,334</b>	<b>192,891</b>	<b>235,265</b>	<b>102,689</b>	<b>706,188</b>
<b>Operational Funds</b>	<b>0</b>	<b>0</b>	<b>65,000</b>	<b>65,000</b>	<b>70,000</b>	<b>200,000</b>
<b>Commodities</b>						
TA vehicles	0	0	0	0	0	0
KARI vehicles	20,000	20,000	0	20,000	0	60,000
TA furn/appliances	0	0	0	0	0	0
Research equipment	25,000	50,000	50,000	75,000	20,000	220,000
<b>Sub-Total</b>	<b>45,000</b>	<b>70,000</b>	<b>50,000</b>	<b>95,000</b>	<b>20,000</b>	<b>280,000</b>
<b>TOTAL</b>	<b>313,193</b>	<b>477,257</b>	<b>369,117</b>	<b>456,491</b>	<b>231,756</b>	<b>1,847,814</b>

## HORTICULTURE COMPONENT

	YEARS					
	1	2	3	4	5	TOTAL
<b>Technical Assistance</b>						
Horticulture Specialist	0	243,002	237,241	265,694	259,606	1,005,543
Candidate interviews	0	15,048	0	0	0	15,048
Horticulture consultants	20,189	39,067	40,818	63,972	66,842	230,888
<b>Sub-Total</b>	<b>20,189</b>	<b>297,117</b>	<b>278,059</b>	<b>329,666</b>	<b>326,448</b>	<b>1,251,479</b>
<b>Participant Training</b>						
PhD Horticulture	39,146	82,206	94,863	105,826	55,179	377,220
PhD Molecular biology	13,049	27,402	31,621	35,275	18,393	125,740
PhD Plant virology	13,097	27,402	31,621	35,275	18,393	125,788
MS Horticulture (US)	0	54,804	115,088	130,972	0	300,864
MS Agroforestry (Kenya)	0	6,584	6,847	7,121	0	20,552
Horticulture workshops	0	8,863	8,863	8,863	8,863	35,452
Visiting scientists	0	0	10,532	10,953	11,391	32,876
<b>Sub-Total</b>	<b>65,291</b>	<b>207,261</b>	<b>299,435</b>	<b>334,285</b>	<b>112,219</b>	<b>1,018,491</b>
<b>Operational Funds</b>	<b>0</b>	<b>0</b>	<b>120,000</b>	<b>120,000</b>	<b>120,000</b>	<b>360,000</b>
<b>Commodities</b>						
TA vehicles	0	20,000	0	0	0	20,000
KARI vehicles	0	20,000	40,000	0	0	60,000
TA furn/appliances	0	5,000	0	0	0	5,000
Research equipment	30,000	100,000	200,000	75,000	20,000	425,000
<b>Sub-Total</b>	<b>30,000</b>	<b>145,000</b>	<b>240,000</b>	<b>75,000</b>	<b>20,000</b>	<b>510,000</b>
<b>TOTAL</b>	<b>115,480</b>	<b>649,378</b>	<b>937,494</b>	<b>858,951</b>	<b>578,667</b>	<b>3,139,970</b>

## SMALL RUMINANTS COMPONENT

	YEARS					
	1	2	3	4	5	TOTAL
<b>Technical Assistance</b>						
SR Breeding consult.	0	0	20,409	21,324	22,281	64,014
SR Nutr./mgmt consult.	18,696	19,533	20,409	0	0	58,638
<b>Sub-Total</b>	<b>18,696</b>	<b>19,533</b>	<b>40,818</b>	<b>21,324</b>	<b>22,281</b>	<b>122,652</b>
<b>Participant Training</b>						
PhD Nutrition	13,049	27,402	31,621	35,275	18,393	125,740
MS Ruminant Nutrition	0	13,079	31,621	35,275	0	79,975
MS Forage Production	0	13,079	31,621	35,275	0	79,975
Small ruminants wrkshops	8,863	8,863	8,863	8,863	8,863	44,315
<b>Sub-Total</b>	<b>21,912</b>	<b>62,423</b>	<b>103,726</b>	<b>114,688</b>	<b>27,256</b>	<b>330,005</b>
<b>Operational Funds</b>	<b>0</b>	<b>0</b>	<b>75,000</b>	<b>75,000</b>	<b>50,000</b>	<b>200,000</b>
<b>Commodities</b>						
KARI vehicles	20,000	0	20,000	0	0	40,000
Research equipment	30,000	30,000	30,000	10,824	0	100,824
<b>Sub-Total</b>	<b>50,000</b>	<b>30,000</b>	<b>50,000</b>	<b>10,824</b>	<b>0</b>	<b>140,824</b>
<b>TOTAL</b>	<b>90,608</b>	<b>111,956</b>	<b>269,544</b>	<b>221,836</b>	<b>99,537</b>	<b>793,481</b>

## AGRICULTURAL RESEARCH FUND

	YEARS					
	1	2	3	4	5	TOTAL
<b>Fundraising consult.</b>	<b>0</b>	<b>21,101</b>	<b>22,055</b>	<b>0</b>	<b>0</b>	<b>43,156</b>
<b>Operational Funds</b>	<b>0</b>	<b>0</b>	<b>7,000</b>	<b>7,000</b>	<b>7,000</b>	<b>21,000</b>
<b>Research Fund Grants</b>	<b>0</b>	<b>0</b>	<b>250,000</b>	<b>50,000</b>	<b>50,000</b>	<b>350,000</b>
<b>TOTAL</b>	<b>0</b>	<b>21,101</b>	<b>279,055</b>	<b>57,000</b>	<b>57,000</b>	<b>414,156</b>

## PROJECT ADMINISTRATION

	YEARS					
	1	2	3	4	5	TOTAL
<b>U.S. Office Salaries</b>						
Campus Coordinator	97,375	102,243	107,356	112,723	118,360	538,057
Travel/Procurement	38,950	40,897	42,942	45,089	47,344	215,222
Fiscal Ass't 1/3 time	14,262	14,996	15,745	16,533	17,359	78,895
Training Sec. Support	18,501	19,426	20,398	21,417	22,488	102,230
<b>Kenya Office Salaries</b>						
Project Administrator	32,848	34,162	35,528	36,949	38,427	177,914
Accountant	19,410	20,186	20,994	21,834	22,707	105,131
Secretaries	26,874	18,634	19,379	20,154	20,960	106,001
Drivers	5,972	6,211	6,460	6,718	6,987	32,348
<b>Vehicles Operation</b>	62,320	64,398	42,845	38,950	38,950	247,463
<b>Office expenses</b>						
Missouri	31,160	31,160	31,160	31,160	31,160	155,800
Kenya	38,950	40,897	42,942	46,740	46,740	216,269
<b>Travel</b>						
Executive visits	7,790	8,102	8,426	8,763	9,113	42,194
Home office	9,088	9,452	9,830	10,223	10,632	49,225
Domestic Travel	5,193	5,193	5,193	5,193	5,193	25,965
<b>SUB-TOTAL</b>	408,693	415,957	409,198	422,446	436,420	2,092,714
<b>Audit &amp; Evaluation</b>	0	0	75,000	100,000	75,000	250,000
<b>TOTAL</b>	408,693	415,957	484,198	522,446	511,420	2,342,714

## ANNEX K

### 5C(1) - COUNTRY CHECKLIST

Listed below are statutory criteria applicable to the eligibility of countries to received the following categories of assistance: (A) both Development Assistance and Economic Support Funds; (B) Development Assistance funds only; or (C) Economic Support Fundsonly.

#### A. COUNTRY ELIGIBILITY CRITERIA APPLICABLE TO BOTH DEVELOPMENT ASSISTANCE AND ECONOMIC SUPPORT FUNDS ASSISTANCE

##### 1. Narcotics

###### a. Negative certification

(FY 1991 Appropriations Act Sec. 559(b)): Has the President certified to the Congress that the government o the recipient country is failing to take adequate measures to prevent narcotic drugs or other controlled substances which are cultivated, produced or processed illicitly, in whole or in part, in such country or transported through such country, from being sold illegally within the jurisdiction of such country to United States Government personnel or their dependents or from entering the United States unlawfully?

No.

###### b. Positive certification

(FAA Sec. 481(h)). (This provision applies to assistance of any kind provided by grant, sale, loan, lease, credit, guaranty, or insurance, except assistance from the Child Survival Fund or relating to international narcotics control, disaster and refugee relief, narcotics education and awareness, or the provision of food or medicine.) If the recipient is a "major illicit drug producing country" (defined as a country producing during a fiscal year at least five metric tons of opium or 500 metric tons of coca or marijuana) or a "major drug-transit country" (defined as a country that is a significant

Kenya has not been identified as a "major illicit drug producing country" or a "major drug transit country."

direct source or illicit drugs significantly affecting the United States, through which such drugs are transported, or through which significant sums or drug-related profits are laundered with the knowledge or complicity of the government):

(1) does the country have in place a bilateral narcotics agreement with the United States, or a multilateral narcotics agreement?

N/A.

(2) has the President in the March 1 International Narcotics Control Strategy Report (INSCR) determined and certified to the Congress (without Congressional enactment, within 45 days of continuous session, of a resolution disapproving such a certification), or has the President determined and certified to the Congress on any other date (with enactment by Congress of a resolution approving such certification), that (a) during the previous year the country has cooperated fully with the United States or taken adequate steps on its own to satisfy the goals agreed to in a bilateral narcotics agreement with the United States or in a multilateral agreement, to prevent illicit drugs produced or processed in or transported through such country from being transported into the United States, to prevent and punish drug profit laundering in the country, and to prevent and punish bribery and other forms of public corruption which facilitate production or shipment of illicit drugs or discourage prosecution of such acts, or that (b) the vital national interests of the United States require the provision of such assistance?

N/A.

**c. Government Policy (1986 Anti-Drug Abuse Act of 1986 Sec. 2013(b)).** (This section applies to the same categories of assistance subject to the restrictions in FAA Sec. 481(h), above.) If recipient country is a "major drug-transit country" (as defined to the purpose of FAA Sec 481(h)), has the President submitted a report to Congress

N/A.

listing such country as one: (a) which, as a matter of government policy, encourages or facilitates the production or distribution of illicit drugs; (b) in which any senior official of the government engages in, encourages, or facilitates the production or distribution of illegal drugs; (c) in which any member of a U.S. Government agency has suffered or been threatened with violence inflicted by or with the complicity of any government officer; or (d) which fails to provide reasonable cooperation to lawful activities of U.S. drug enforcement agents, unless the President has provided the required certification to Congress pertaining to U.S. national interests and the drug control and criminal prosecution efforts of that country?

**2. Indebtedness to U.S. citizens**

(FAA Sec. 620(c): If assistance is to a government, is the government indebted to any U.S. citizen for goods or services furnished or ordered where: (a) such citizen has exhausted available legal remedies, (b) the debt is not denied or contested by such government, or (c) the indebtedness arises under an unconditional guaranty of payment given by such government or controlled entity?

No.

**3. Seizure of U.S. Property (FAA**

Sec. 620(e) (1)): If assistance is to a government, has it (including any government agencies or subdivisions) taken any action which has the effect of rationalizing, expropriating, or otherwise seizing ownership or control of property of U.S. citizens or entities beneficially owned by them without taking steps to discharge its obligations toward such citizens or entities?

No.

**4. Communist countries (FAA Secs.**

620(a), 620(f), 620D; FY 1991 Appropriations Act Secs. 512, 545): Is recipient country a Communist country? If so, has the President: (a) determined that assistance to the country is vital to the security of the United States, that the international

No.

Communist conspiracy, and that such assistance will further promote the independence of the recipient country from international communism, or (b) removed a country from applicable restrictions on assistance to communist countries upon a determination and report to Congress that such action is important to the national interest of the United States? Will assistance be provided either directly or indirectly to Angola, Cambodia, Cuba, Iraq, Libya, Vietnam, Iran or Syria? Will assistance be provided to Afghanistan without a certification, or will assistance be provided inside afghanistan through the Soviet-controlled government or Afghanistan?

**5. Mob Action (FAA Sec. 620(j)):**  
Has the country permitted, or failed to take adequate measures to prevent, damage or destruction by mob action of U.S. property?

No.

**6. OPIC Investment Guaranty (FAA Sec. 620(1)):** Has the country failed to enter into an investment guaranty agreement with OPIC?

No.

**7. Seizure of U.S. Fishing Vessels (FAA Sec. 620(o); Fishermen's Protective Act of 1967 (as amended) Sec. 5):** (a) Has the country seized, or imposed any penalty or sanction against, any U.S. fishing vessel because of fishing activities in international waters? (b) If so, has any deduction required by the Fishermen's Protective Act been made?

No, the country has not seized, imposed any penalty or sanction against, any U.S. fishing vessel because of fishing activities in international waters.

**8. Loan Default (FAA Sec. 620(q); FY 1991 Appropriations Act Sec. 518 (Brooke Amendment)):** (a) Has the government of the recipient country been in default for more than six months on interest or principal of any loan to the country under the FAA? (b) Has the country been in default for more than one year on interest or principal on any U.S. loan under a program for which the FY 1990 Appropriations Act appropriates funds?

As of May 29, 1992, Kenya is not subject to either sanction. If an applicable payment is not made by July 2, 1992, it will become subject to 620(q), in which case no further obligation will be made.



**9. Military Equipment** (FAA Sec. 620(s)): If contemplated assistance is development loan or to come from Economic support Funds, has the Administrator taken into account the percentage of the country's budget and amount of the country's foreign exchange or other resources spent on military equipment? (Reference may be made to the annual "Taking Into Consideration" memo: "Yes, taken into account by the Administrator at time of approval of Agency OYB." This approval by the Administrator of the Operational Year Budget can be the basis for an affirmative answer during the fiscal year unless significant changes in circumstances occur.)

This was taken into consideration by the Administrator.

**10. Diplomatic Relations with U.S.** (FAA Sec. 620(t)): Has the country severed diplomatic relations with the United States? If so, have relations been resumed and have new bilateral assistance agreements been negotiated and entered into since such resumption?

No.

**11. U.N. Obligations** (FAA Sec. 620(u)): What is the payment status of the country's U.N. obligations? If the country is in arrears, were such arrearages taken into account by the A.I.D. Administrator in determining the current A.I.D. Operational Year Budget? (Reference may be made to the "Taking into Consideration" memo.)

While Kenya was slightly in arrears as of January 1, 1991, this was taken into consideration by the Administrator. Kenya was not delinquent within the meaning of Article 19 of the U.N. Charter.

## **12. International Terrorism**

**a. Sanctuary and support** (FY 1991 Appropriations Act Sec. 556; FAA Sec. 620A): Has the country been determined by the president to: (a) grant sanctuary from prosecution to any individual or group which has committed an act of international terrorism, or (b) otherwise support international terrorism, unless the President has waived this restriction on grounds of national security or for humanitarian reasons?

No.

**b. Airport Security** (ISDCA of 1985 Sec. 552(b)). Has the Secretary of State determined that the country is a high terrorist threat country after the Secretary of Transportation has determined, pursuant to section 1115(e)(2) of the Federal Aviation Act of 1958, that an airport in the country does not maintain and administer effective security measures?

No.

**13. Discrimination** (FAA Sec. 666(b)): Does the country object, on the basis of race, religion, national origin or sex, to the presence of any officer or employee of the U.S. who is present in such country to carry out economic development programs under the FAA?

No.

**14. Nuclear Technology** (FAA Secs. 669, 670): Has the country, after August 3, 1977, delivered to any other country or received nuclear enrichment or reprocessing equipment, materials, or technology, without specified arrangements or safeguards, and without special certification by the President? Has it transferred a nuclear explosive device to a non-nuclear weapon state, or if such a state, either received or detonated a nuclear explosive device? If the country is a non-nuclear weapon state, has it, on or after August 8, 1985, exported (or attempted to export) illegally from the United States any material, equipment, or technology which would contribute significantly to the ability of a country to manufacture a nuclear explosive device? (FAA Sec. 620E permits a special waiver of Sec. 669 or Pakistan.)

No.

**15. Algiers Meeting** (ISDCA of 1981, Sec. 720): Was the country represented at the Meeting of Ministers of Foreign Affairs and Heads of Delegations of the Non-Aligned Countries to the 36th General Assembly of the U.N. on Sept. 25 and 28, 1981, and did it fail to disassociate itself from the communique issued? If so, has the President taken

While Kenya was represented and failed to disassociate itself, this was taken into consideration by the Administrator.

it into account? (Reference may be made to the "Taking into Consideration" memo.)

**16. Military Coup** (FY 1991 Appropriations Act Sec. 513): Has the duly elected Head of Government of the country been deposed by military coup or decree ? If assistance has been terminated, has the President notified Congress that a democratically elected government has taken office prior to the resumption of assistance?

No.

**17. Refugee Cooperation** (FY 1991 Appropriations Act Sec. 539): Does the recipient country fully cooperate with the international refugee assistance organizations, the United States, and other governments in facilitating lasting solutions to refugee situations, including resettlement without respect to race, sex, religion, or national origin?

Yes.

**18. Exploitation of Children** (FY 1991 Appropriations Act Sec. 599D, amending FAA Sec. 116): Does the recipient government fail to take appropriate and adequate measures, within its means, to protect children from exploitation, abuse or forced conscription into military or paramilitary services?

No.

**B. COUNTRY ELIGIBILITY CRITERIA  
APPLICABLE ONLY TO DEVELOPMENT  
ASSISTANCE ("DA")**

**1. Human Rights Violations** (FAA Sec. 116): Has the Department of State determined that this government has engaged in a consistent pattern of gross violations of internationally recognized human rights? If so, can it be demonstrated that contemplated assistance will directly benefit the needy?

No.

**2. Abortions** (FY 1991 Appropriations Act Sec. 535): Has the President certified that use of DA funds

No.

by this country would violate any of the prohibitions against use of funds to pay for the performance of abortions as a method of family planning, to motivate or coerce any person to practice abortions, to pay for the performance of involuntary sterilization as a method of family planning, to coerce or provide any financial incentive to any person to undergo sterilizations, to pay for any biomedical research which relates, in whole or in part, to methods of, or the performance of, abortions or involuntary sterilization as a means of family planning?

C. COUNTRY ELIGIBILITY CRITERIA  
APPLICABLE ONLY TO ECONOMIC SUPPORT  
FUNDS ("ESF")

**Human Rights Violations** (FAA Sec. 502B): Has it been determined that the country has engaged in a consistent pattern of gross violations of internationally recognized human rights? If so, has the President found that the country made such significant improvement in its human rights record that furnishing such assistance is in the U.S. national interest?

No.

## ANNEX L

### 5C(2) - ASSISTANCE CHECKLIST

Listed below are statutory criteria applicable to the assistance resources themselves, rather than to the eligibility of a country to receive assistance. This section is divided into three parts. Part A includes criteria applicable to both Development Assistance and Economic Support Funds resources. Part B includes criteria applicable only to Development Assistance resources. Part C includes criteria applicable only to Economic Support Funds.

CROSS REFERENCE: IS COUNTRY CHECKLIST UP TO DATE?

Yes.

#### A. CRITERIA APPLICABLE TO BOTH DEVELOPMENT ASSISTANCE AND ECONOMIC SUPPORT FUNDS

##### 1. Host Country Development Efforts

(FAA Sec. 601(a)): Information and conclusions on whether assistance will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture, and commerce; and (f) strengthen free labor unions.

The assistance provided will strengthen the national agricultural research effort to introduce new and more productive technologies while also strengthening public/private sector research linkages.

##### 2. U.S. Private Trade and

##### Investment (FAA Sec. 601(b)):

Information and conclusions on how assistance will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).

Kenya's research program has and will continue to develop linkages with U.S. private enterprise such as Pioneer Seed and Cargill Seed.

### 3. Congressional Notification

**a. General requirement** (FY 1991 Appropriations Act Secs. 523 and 591; FAA Sec. 634A): If money is to be obligated for an activity not previously justified to Congress, or for an amount in excess of amount previously justified to Congress, has Congress been properly notified (unless the notification requirement has been waived because of substantial risk to human health or welfare)?

Yes.

**b. Notice of new account obligation** (FY 1991 Appropriations Act Sec. 514): If funds are being obligated under an appropriation account to which they were not appropriated, has the President consulted with and provided a written justification to the House and Senate Appropriations Committees and has such obligation been subject to regular notification procedures?

N/A.

**c. Cash transfers and nonproject sector assistance** (FY 1991 Appropriations Act Sec. 575(b)(3)): If funds are to be made available in the form of cash transfer or nonproject sector assistance, has the Congressional notice included a detailed description of how the funds will be used, with a discussion of U.S. interests to be served and a description of any economic policy reforms to be promoted?

N/A.

**4. Engineering and Financial Plans** (FAA Sec. 611(a)): Prior to an obligation in excess of \$500,000, will there be: (a) engineering, financial or other plans necessary to carry out the assistance; and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

N/A.

**5. Legislative Action** (FAA Sec. 611(s)(2)): If legislative action is required within recipient country with respect to an obligation in excess of \$500,000, what is the basis for a reasonable expectation that such action will be completed in time to permit orderly accomplishment of the purpose of the assistance?

N/A.

**6. Water Resources** (FAA Sec. 611(b); FY 1991 Appropriations Act Sec. 501): If project is for water or water-related land resource construction, has benefits and costs been computed to the extent practicable in accordance with the principles, standards, and procedures established pursuant to the Water Resources Planning Act (42 U.S.C. 1962, et seq.)? (See A.I.D. Handbook 3 for guidelines.)

N/A.

**7. Cash Transfer and Sector Assistance** (FY 1991 Appropriations Act Sec. 575(b)): Will cash transfer or nonproject sector assistance be maintained in a separate account and not commingled with other funds (unless such requirements are waived by Congressional notice for nonproject sector assistance)?

N/A.

**8. Capital Assistance** (FAA Sec. 611(e)): If project is capital assistance (e.g., construction), and total U.S. assistance for it will exceed \$1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability to maintain and utilize the project effectively?

N/A.

**9. Multiple Country Objectives** (FAA Sec. 601(a)): Information and conclusions on whether projects will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use

See A.1. above.

of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.

**10. U.S. Private Trade** (FAA Sec.601(b)): Information and conclusions on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).

The National Agricultural Research Program in Kenya will continue to develop ties with U.S. firms such as Cargill, Pioneer and others where appropriate.

**11. Local Currencies**

**a. Recipient Contributions** (FAA Secs. 612(b), 636(h)): Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized in lieu of dollars.

A CP or Covenant to this grant agreement requires that the GOK will continue to provide local currency funding at levels established prior to this activity and with annual increases to assume U.S. contributions to project operational costs.

In year one of this activity the GOK will release an agreed upon document of counterpart funding as per AID/GOK programming agreements. Years 2-5 will have no counterpart funding.

**b. U.S.-Owned Currency** (FAA Sec. 612(d)): Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?

No.

**c. Separate Account** (FY 1991 Appropriations Act Sec. 575). If assistance is furnished to a foreign government under arrangements which result in the generation of local currencies:

N/A.



(1) Has A.I.D. (a) required that local currencies be deposited in a separate account established by the recipient government, (b) entered into an agreement with that government providing the amount of local currencies to be generated and the terms and conditions under which the currencies so deposited may be utilized, and (c) established by agreement the responsibilities of A.I.D. and that government to monitor and account for deposits into and disbursements from the separate account?

(2) Will such local currencies, or an equivalent amount of local currencies, be used only to carry out the purposes of the DA or ESF chapters of the FAA (depending on which chapter is the source of the assistance) or for the administrative requirements of the United States Government?

(3) Has A.I.D. taken all appropriate steps to ensure that the equivalent of local currencies disbursed from the separate account are used for the agreed purposes?

(4) If assistance is terminated to a country, will any unencumbered balances of funds remaining in a separate account be disposed of for purposes agreed to by the recipient government and the United States Government?

## **12. Trade Restrictions**

**a. Surplus Commodities** (FY 1991 Appropriations Act Sec. 521(a)): If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity?

N/A.

**b. Textiles (Lautenberg Amendment)** (FY 1991 Appropriations Act Sec. 521(c)): Will the assistance (except for programs in Caribbean Basin Initiative countries under U.S. Tariff Schedule "Section 807," which allows reduced tariffs on articles assembled abroad from U.S.-made components) be used directly to procure feasibility studies, prefeasibility studies, or project profiles of potential investment in, or to assist the establishment of facilities specifically designed for, the manufacture for export to the United States or to third country markets in direct competition with U.S. exports, of textiles, apparel, footwear, handbags, flat goods (such as wallets or coin purses worn on the person), work gloves or leather wearing apparel?

N/A.

**13. Tropical Forests** (FY 1991 Appropriations Act Sec. 533(c)(3)): Will funds be used for any program, project or activity which would (a) result in any significant loss of tropical forests, or (b) involve industrial timber extraction in primary tropical forest areas?

No.

**14. PVO Assistance**

**a. Auditing and registration** (FY 1991 Appropriations Act Sec. 537): If assistance is being made available to a PVO, has that organization provided upon timely request any document, file, or record necessary to the auditing requirements of A.I.D., and is the PVO registered with A.I.D.?

N/A.

**b. Funding sources** (FY 1991 Appropriations Act, Title II, under heading "Private and Voluntary Organizations"): If assistance is to be made to a United States PVO (other than a cooperative development

N/A.

organization), does it obtain at least 20 percent of its total annual funding for international activities from sources other than the United States Government?

**15. Project Agreement**

**Documentation** (State Authorization Sec. 139 (as interpreted by conference report)): Has confirmation of the date of signing of the project agreement, including the amount involved, been cabled to State L/T and A.I.D. LEG within 60 days of the agreement's entry into force with respect to the United States, and has the full text of the agreement been pouched to those same offices? (See Handbook 3, Appendix 6G for agreements covered by this provision).

Confirmation of signing date and amount will be cabled within 60 days of agreement entry into force. Full text will be pouched.

**16. Metric System** (Omnibus Trade and Competitiveness Act of 1988 Sec. 5164, as interpreted by conference report, amending Metric Conversion Act of 1975 Sec. 2, and as implemented through A.I.D. policy): Does the assistance activity use the metric system of measurement in its procurements, grants, and other business-related activities, except to the extent that such use is impractical or is likely to cause significant inefficiencies or loss of markets to United States firms? Are bulk purchases usually to be made in metric, and are components, subassemblies, and semi-fabricated materials to be specified in metric units when economically available and technically adequate? Will A.I.D. specifications use metric units of measure from the earliest programmatic stages, and from the earliest documentation of the assistance processes (for example, project papers) involving quantifiable measurements (length, area, volume, capacity, mass and weight), through the implementation stage?

N/A.

**17. Women in Development** (FY 1991 Appropriations Act, Title II, under heading "Women in Development"): Will assistance be designed so that the percentage of women participants will be demonstrably increased?

Yes.

**18. Regional and Multilateral Assistance** (FAA Sec. 209): Is assistance more efficiently and effectively provided through regional or multilateral organizations? If so, why is assistance not so provided? Information and conclusions on whether assistance will encourage developing countries to cooperate in regional development programs.

No.

**19. Abortions** (FY 1991 Appropriations Act, Title II, under heading "Population, DA," and Sec. 525):

N/A.

a. Will assistance be made available to any organization or program which, as determined by the President, supports or participates in the management of a program of coercive abortion or involuntary sterilization?

b. Will any funds be used to lobby for abortion?

**20. Cooperatives** (FAA Sec. 111): Will assistance help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward a better life?

N/A.

**21. U.S.-Owned Foreign Currencies**

a. **Use of currencies** (FAA Secs. 612(b), 636(h); FY 1991 Appropriations Act Secs. 507, 509): Describe steps taken to assure that, to the maximum extent possible, foreign currencies owned by the U.S. are utilized in lieu of dollars to meet the cost of contractual and other services.

No U.S. owned foreign currencies will be utilized.

**b. Release of currencies** (FAA Sec. 612(d)): Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?

See 21.a.

## **22. Procurement**

**a. Small business** (FAA Sec. 602(a)): Are there arrangements to permit U.S. small business to participate equitably in the furnishing of commodities and services financed?

This is an amendment to an existing grant which was determined to be a Title XII set-aside.

**b. U.S. procurement** (FAA Sec. 604(a)): Will all procurement be from the U.S. except as otherwise determined by the President or determined under delegation from him?

Yes.

**c. Marine insurance** (FAA Sec. 604(d)): If the cooperating country discriminates against marine insurance companies authorized to do business in the U.S., will commodities be insured in the United States against marine risk with such a company?

N/A.

**d. Non-U.S. agricultural procurement** (FAA Sec. 604(e)): If non-U.S. procurement of agricultural commodity or product thereof is to be financed, is there provision against such procurement when the domestic price of such commodity is less than parity? (Exception where commodity financed could not reasonably be procured in U.S.)

N/A.

**e. Construction or engineering services** (FAA Sec. 604(g)): Will construction or engineering services be procured from firms of advanced developing countries which are otherwise eligible under Code 941 and which have attained a competitive capability in international markets in one of

N/A - No construction.

these areas? (Exception for those countries which receive direct economic assistance under the FAA and permit United States firms to compete for construction or engineering services financed from assistance programs of these countries.)

**f. Cargo preference shipping** (FAA Sec. 603)): Is the shipping excluded from compliance with the requirement in section 901(b) of the Merchant Marine Act of 1936, as amended, that at least 50 percent of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S. flag commercial vessels to the extent such vessels are available at fair and reasonable rates?

N/A - No such shipping anticipated.

**g. Technical Assistance** (FAA Sec. 621(a)): If technical assistance is financed, will such assistance be furnished by private enterprise on a contract basis to the fullest extent practicable? Will the facilities and resources of other Federal agencies be utilized, when they are particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs?

TA will be provided. This is an amendment to an existing agreement which was competitively secured.

**h. U.S. air carriers** (International Air Transportation Fair Competitive Practices Act, 1974): If air transportation of persons or property is financed on grant basis, will U.S. carriers be used to the extent such service is available?

Yes.

**i. Termination for convenience of U.S. Government** (FY 1991 Appropriations Act Sec. 504): If the U.S. Government is a party to a contract for procurement, does the contract contain a provision

Yes.

authorizing termination of such contract for the convenience of the United States?

**j. Consulting services** (FY 1991 Appropriations Act Sec. 524): If assistance if for consulting service through procurement contract pursuant to 5 U.S.C. 3109, are contract expenditures a matter of public record and available for public inspection (unless otherwise provided by law or Executive order)?

Yes.

**k. Metric conversion** (Omnibus Trade and Competitiveness Act of 1988, as interpreted by conference report, amending Metric Conversion Act of 1975 Sec. 2, and as implemented through A.I.D. policy): Does the Assistance program use the metric system of measurement in its procurements, grants, and other business-related activities, except to the extent that such use is impractical or is likely to cause significant inefficiencies or loss of markets to United States firms? Are bulk purchases usually to be made in metric, and are components, subassemblies, and semi-fabricated materials to be specified in metric units when economically available and technically adequate? Will A.I.D. specifications use metric units of measure from the earliest programmatic stages, and from the earliest documentation of the assistance processes (for example, project papers) involving quantifiable measurements (length, area, volume, capacity, mass and weight), through the implementation stage?

Yes.

**i. Competitive Selection Procedures** (FAA Sec. 601(e)): Will the assistance utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?

Yes. This is an amendment to an existing contract which was competitively procured and the sole source amendment has been approved by the AA/AFR.

## 23. Construction

**a. Capital project** (FAA Sec. 601(d)): If capital (e.g., construction) project, will U.S. engineering and professional services be used? N/A.

**b. Construction contract** (FAA Sec. 611(c)): If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable? N/A.

**c. Large Projects, Congressional approval** (FAA Sec. 620(k)): If for construction of productive enterprise, will aggregate value of assistance to be furnished by the U.S. not exceed \$100 million (except for productive enterprises in Egypt that were described in the Congressional Presentation), or does assistance have the express approval of Congress? N/A.

**24. U.S. Audit Rights** (FAA Sec. 301(d)): If fund is established solely by U.S. contributions and administered by an international organization, does Controller General have audit rights? Yes.

**25. Communist Assistance** (FAA Sec. 620(h)). Do arrangements exist to insure that United States foreign aid is not used in a manner which, contrary to the best interests of the United States, promotes or assists the foreign aid projects or activities of the Communist-bloc countries? Yes.

## 26. Narcotics

**a. Cash reimbursements** (FAA Sec. 483): Will arrangements preclude use of financing to make reimbursements, in the form of cash payments, to persons whose illicit drug crops are eradicated? Yes.



**b. Assistance to narcotics traffickers** (FAA Sec. 487): Will arrangements take "all reasonable steps" to preclude use of financing to or through individuals or entities which we know or have reason to believe have either: (1) been convicted of a violation of any law or regulation of the United States or a foreign country relating to narcotics (or other controlled substances); or (2) been an illicit trafficker in, or otherwise involved in the illicit trafficking of, any such controlled substance?

Yes.

**27. Expropriation and Land Reform** (FAA Sec. 620(g)): Will assistance preclude use of financing to compensate owners for expropriated or nationalized property, except to compensate foreign nationals in accordance with a land reform program certified by the President?

Yes.

**28. Police and Prisons** (FAA Sec. 660): Will assistance preclude use of financing to provide training, advice, or any financial support for police, prisons, or other law enforcement forces, except for narcotics programs?

Yes.

**29. CIA Activities** (FAA Sec. 662): Will assistance preclude use of financing for CIA activities?

Yes.

**30. Motor Vehicles** (FAA Sec. 636(i)): Will assistance preclude use of financing for purchase, sale, long-term lease, exchange or guaranty of the sale of motor vehicles manufactured outside U.S., unless a waiver is obtained?

No waiver is required with DFA procurement.

**31. Military Personnel** (FY 1991 Appropriations Act Sec. 503): Will assistance preclude use of financing to pay pensions, annuities, retirement pay, or adjusted service compensation for prior or current military personnel?

Yes.

**32. Payment of U.N. Assessments**  
(FY 1991 Appropriations Act Sec. 505): Will assistance preclude use of financing to pay U.N. assessments, arrearages or dues? Yes.

**33. Multilateral Organization Lending** (FY 1991 Appropriations Act Sec. 506): Will assistance preclude use of financing to carry out provisions of FAA Section 209(d) (transfer of FAA funds to multilateral organizations for lending)? Yes.

**34. Export of Nuclear Resources**  
(FY 1991 Appropriations Act Sec. 510): Will assistance preclude use of financing to finance the export of nuclear equipment, fuel, or technology? Yes.

**35. Repression of Population** (FY 1991 Appropriations Act Sec. 511): Will assistance preclude use of financing for the purpose of aiding the efforts of the government of such country to repress the legitimate rights of the population of such country contrary to the Universal declaration of Human Rights? Yes.

**36. Publicity or Propaganda** (FY 1991 Appropriations Act Sec. 516): Will assistance be used for publicity or propaganda purposes designed to support or defeat legislation pending before Congress, to influence in any way the outcome of a political election in the United States, or for any publicity or Propaganda purposes not authorized by Congress? No.

**37. Marine Insurance** (FY 1991 Appropriations Act Sec. 563): Will any A.I.D. contract and solicitation, and subcontract entered into under such contract, include a clause requiring that U.S. marine insurance companies have a fair opportunity to bid for Yes.

marine insurance when such insurance is necessary or appropriate?

**38. Exchange for Prohibited Act**

(FY 1991 Appropriations Act Sec.

569): Will any assistance be provided to any foreign government (including any instrumentality or agency thereof), foreign person, or United States person in exchange for that foreign government or person undertaking any action which is, if carried out by the United States Government, a United States Official or employee, expressly prohibited by a provision of United States law?

No.

**B. CRITERIA APPLICABLE TO DEVELOPMENT ASSISTANCE ONLY**

**1. Agricultural Exports**

**(Bumpers Amendment)** (FY 1991 Appropriations Act Sec. 521(b), as interpreted by conference report for original enactment): If assistance is for agricultural development activities (specifically, any testing or breeding feasibility study, variety improvement or introduction, consultancy, publication, conference, or training), are such activities: (1) specifically and principally designed to increase agricultural exports by the host country to a country other than the United States, where the export would lead to direct competition in that third country with exports of a similar commodity grown or produced in the United States, and can the activities reasonably be expected to cause substantial injury to U.S. exporters of a similar agricultural commodity; or (2) in support of research that is intended primarily to benefit U.S. producers?

No direct competition is planned.

**2. Tied Aid Credits** (FY 1991 Appropriations Act, Title II, under heading "Economic Support Fund"): Will DA funds be used for tied aid credits?

N/A.

**3. Appropriate Technology** (FAA Sec. 107): Is special emphasis placed on use of appropriate technology (defined as relatively smaller, cost-saving, labor-using technologies that are generally most appropriate for the small farms, small businesses, and small incomes of the poor)?

Yes. The project will emphasize on-farm appropriate research technologies.

**4. Indigenous Needs and Resources** (FAA Sec. 281(b)): Describe extent to which the activity recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civic education and training in skills required for effective participation in governmental and political processes essential to self-government.

The project is fully responsive to the needs of the local population, institutional development, employment and public participation in guiding research programming.

**5. Economic Development** (FAA Sec. 101(a)): Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase of productive capacities and self-sustaining economic growth?

Yes.

**6. Special Development Emphases** (FAA Secs. 102(b), 113, 281(a)): Describe extent to which activity will: (a) effectively involve the poor in development by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, dispersing investment from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a

The focus of the project will be developing appropriate research technologies for small farm producers in Kenya. A Farming Systems Approach will be used and careful monitoring and evaluation of project impact will be undertaken. The TA will be provided by U>S> universities through the Title XII mechanism. As much of Kenya's farm

sustained basis, using appropriate U.S. institutions; (b) encourage democratic private and local governmental institutions; (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries.

production is in the hands of women, the activities and technologies devised under this project will directly impact women and improve the status of women.

**7. Recipient Country Contribution**

(FAA Secs. 110, 124(d): Will the recipient country provide at least 25 percent of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or is the latter cost-sharing requirement being waived for a "relatively least developed" country)?

Yes.

**8. Benefit to Poor Majority**

(FAA Sec. 128(b)): If the activity attempts to increase the institutional capabilities of private organizations or the government of the country, or if it attempts to stimulate scientific and technological research, has it been designed and will it be monitored to ensure that the ultimate beneficiaries are the poor majority?

Yes.

**9. Abortions** (FAA Sec. 104(f); FY 1991 Appropriations Act, Title II, under heading "Population, DA," and Sec. 535):

a. Are any of the funds to be used for the performance of abortions as a method of family planning or to motivate or coerce any person to practice abortions?

N/A.

b. Are any of the funds to be used to pay for the performance of involuntary sterilization as a method of family planning or to coerce or provide any financial incentive to any person to undergo sterilizations?

c. Are any of the funds to be made available to any organization or program which, as determined by the President, supports or participates in the management of a program of coercive abortion or involuntary sterilization?

d. Will funds be made available only to voluntary family planning projects which offer, either directly or through referral to, or information about access to, a broad range of family planning methods and services?

e. In awarding grants for natural family planning, will any applicant be discriminated against because of such applicant's religious or conscientious commitment to offer only natural family planning?

f. Are any of the funds to be used to pay for any biomedical research which relates, in whole or in part, to methods of, or the performance of, abortions or involuntary sterilization as a means of family planning?

g. Are any of the funds to be made available to any organization if the President certifies that the use of these funds by such organization would violate any of the above provisions related to abortions any involuntary sterilization?

**10. Contract Awards (FAA Sec. 601(e)):** Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?

Yes.

**11. Disadvantaged Enterprises (FY 1991 Appropriations Act Sec. 567):** What portion of the funds will be available only for activities of economically and socially

10% Gray Amendment Requirement.

disadvantaged enterprises, historically black colleges and universities, colleges and universities having a student body in which more than 40 percent of the students are Hispanic Americans, and private and voluntary organizations which are controlled by individuals who are black Americans, Hispanic Americans, or Native Americans, or how are economically or socially disadvantaged (including women)?

**12. Biological Diversity** (FAA Sec. 119(g): Will the assistance: (a) support training and education efforts which improve the capacity of recipient countries to prevent loss of biological diversity; (b) be provided under a long-term agreement in which the recipient country agrees to protect ecosystems or other wildlife habitats; (c) support efforts to identify and survey ecosystems in recipient countries worthy of protection; or (d) by any direct or indirect means significantly degrade national parks or similar protected areas or introduce exotic plants or animals into such areas?

N/A.

**13. Tropical Forests** (FAA Sec. 118; FY 1991 Appropriations Act Sec. 533(c)-(e) & (g)):

N/A.

**a. A.I.D. Regulation 16:** Does the assistance comply with the environmental procedures set forth in A.I.D. Regulation 16?

**b. Conservation:** Does the assistance place a high priority on conservation and sustainable management of tropical forests? Specifically, does the assistance, to the fullest extent feasible: (1) stress the importance of conserving and sustainably managing forest resources; (2) support activities which offer employment and income alternatives to those who otherwise would cause

destruction and loss of forests, and help countries identify and implement alternatives to colonizing forested areas; (3) support training programs, educational efforts, and the establishment or strengthening of institutions to improve forest management; (4) help end destructive slash-and-burn agriculture by supporting stable and productive farming practices; (5) help conserve forests which have not yet been degraded by helping to increase production on lands already cleared or degraded; (6) conserve forested watersheds and rehabilitate those which have been deforested; (7) support training, research, and other actions which lead to sustainable and more environmentally sound practices for timber harvesting, removal, and processing; (8) support research to expand knowledge of tropical forests and identify alternatives which will prevent forest destruction, loss, or degradation; (9) conserve biological diversity in forest areas by supporting efforts to identify, establish, and maintain a representative network of protected tropical forest ecosystems on a worldwide basis, by making the establishment of protected areas a condition of support for activities involving forest clearance or degradation, and by helping to identify tropical forest ecosystems and species in need of protection and establish and maintain appropriate protected areas; (10) seek to increase the awareness of U.S. Government agencies and other donors of the immediate and long-term value of tropical forests; (11) utilize the resources and abilities of all relevant U.S. government agencies; (12) be based upon careful analysis of the alternatives available to achieve the best sustainable use of the land; and (13) take full account



of the environmental impacts of the proposed activities on biological diversity?

**c. Forest degradation:** Will assistance be used for: (1) the procurement or use of logging equipment, unless an environmental assessment indicates that all timber harvesting operations involved will be conducted in an environmentally sound manner and that the proposed activity will produce positive economic benefits and sustainable forest management systems; (2) actions which will significantly degrade national parks or similar protected areas which contain tropical forests, or introduce exotic plants or animals into such areas; (3) activities which would result in the conversion of forest lands to the rearing of livestock; (4) the construction, upgrading, or maintenance of roads (including temporary haul roads for logging or other extractive industries) which pass through relatively undergraded forest lands; (5) the colonization of forest lands; or (6) the construction of dams or other water control structures which flood relatively undergraded forest lands, unless with respect to each such activity an environmental assessment indicates that the activity will contribute significantly and directly to improving the livelihood of the rural poor and will be conducted in an environmentally sound manner which supports sustainable development?

**d. Sustainable forestry:** If assistance relates to tropical forests, will project assist countries in developing a systematic analysis of the appropriate use of their total tropical forest resources, with the goal of developing a national program for sustainable forestry?

**e. Environmental impact**

**statements:** Will funds be made available in accordance with provisions of FAA Section 117(c) and applicable A.I.D. regulations requiring an environmental impact statement for activities significantly affecting the environment?

**14. Energy** (FY 1991 Appropriations Act Sec. 533(c)): If assistance relates to energy, will such assistance focus on: (a) end-use energy efficiency, least-cost energy planning, and renewable energy resources, and (b) the key countries where assistance would have the greatest impact on reducing emissions from greenhouse gases?

N/A.

**15. Sub-Saharan Africa Assistance** (FY 1991 Appropriations Act Sec. 562, adding a new FAA chapter 10 (FAA Sec. 496)): If assistance will come from the Sub-Saharan Africa DA account, is it: (a) to be used to help the poor majority in sub-Saharan Africa through a process of long-term development and economic growth that is equitable, participatory, environmentally sustainable, and self-reliant; (b) to be used to promote sustained economic growth, encourage private sector development, promote individual initiatives, and help to reduce the role of central governments in areas more appropriate for the private sector; (c) being provided in accordance with the policies contained in FAA section 102; (d) being provided in close consultation with African, United States and other PVOs that have demonstrated effectiveness in the promotion of local grassroots activities on behalf of long-term development in Sub-Saharan Africa; (e) being used to promote reform of sectoral economic policies, to support the critical sector

a. Much of the research effort will be directed toward developing technologies for small resource poor Kenyan farmers.

b. Yes.

c. Yes.

d. No. Not applicable to this project.

e. Yes. This assistance will be directed to improving national research capacity and to the development of improved and appropriate technologies.

f. Yes. A farming system approach will be used which takes into account all farm resources including the natural resource base.

priorities of agricultural production and natural resources, health, voluntary family planning services, education, and income generating opportunities, to being about appropriate sectoral restructuring of the Sub-Saharan African economies, to support reform in public administration and finances and to establish a favorable environment for individual enterprise and self-sustaining development, and to take into account, in assisted policy reforms, the need to protect vulnerable groups; (f) being used to increase agricultural production in ways that protect and restore the natural resource base, especially food production, to maintain and improve basic transportation and communication networks, to maintain and restore the renewable natural resource base in ways that increase agricultural production, to improve health conditions with special emphasis on meeting the health needs of mothers and children, including the establishment of self-sustaining primary health care systems that give priority to preventive care, to provide increased access to voluntary family planning services, to improve basic literacy and mathematics especially to those outside the formal educational system and to improve primary education, and to develop income-generating opportunities for the unemployed and underemployed in urban and rural areas?

**16. Debt-for-Nature Exchange** (FAA Sec. 463): If project will finance a debt-for-nature exchange, describe how the exchange will support protection of: (a) the world's oceans and atmosphere, (b) animal and plant species, and (c) parks and reserves; or describe how the exchange will promote: (d) natural resource management, (e) local conservation programs, (f)

N/A.

conservation training programs, (g) public commitment to conservation, (h) land and ecosystem management, and (i) regenerative approaches in farming, forestry, fishing, and watershed management.

**17. Deobligation/Reobligation** (FY 1991 Appropriations Act Sec. 515): If deob/reob authority is sought to be exercised in the provision of DA assistance, are the funds being obligated for the same general purpose, and for countries within the same region as originally obligated, and have the House and Senate Appropriations Committees been properly notified?

N/A.

**18. Loans**

**a. Repayment capacity** (FAA Sec. 122(b)): Information and conclusion on capacity of the country to repay the loan at a reasonable rate of interest.

N/A.

**b. Long-range plans** (FAA Sec. 122(b)): Does the activity give reasonable promise of assisting long-range plans and programs designed to develop economic resources and increase productive capacities?

**c. Interest rate** (FAA Sec. 122(b)): If development loan is repayable in dollars, is interest rate at least 2 percent per annum during a grace period which is not to exceed ten years, and at least 3 percent per annum thereafter?

**d. Exports to United States** (FAA Sec. 620(d)): If assistance is for any productive enterprise which will compete with U.S. enterprises, is there an agreement by the recipient country to prevent export to the U.S. of more than 20 percent of the enterprise's annual production during the life of the loan, or has the requirement to enter into such an agreement been

waived by the President because of a national security interest?

**19. Development Objectives (FAA Secs. 102(a), 111, 113, 281(a)):**

Extent to which activity will: (1) effectively involve the poor in development, by expanding access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using the appropriate U.S. institutions; (2) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions; (3) support the self-help efforts of developing countries; (4) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (5) utilize and encourage regional cooperation by developing countries?

1. Increased farm productivity and farm incomes. Increased employment through promotion of high value, labor intensive export related crops.

2. N/A.

3. N/A.

4. Women will share equally in all project activities.

5. Yes.

**20. Agriculture, Rural Development and Nutrition, and Agricultural Research (FAA Secs. 103 and 103A):**

**a. Rural poor and small farmers:** If assistance is being made available for agriculture, rural development or nutrition, describe extent to which activity is specifically designed to increase productivity and income of rural poor; or if assistance is being made available for agricultural research, has account been taken of the needs of small farmers, and extensive use of field testing to adapt basic research to local conditions shall be made.

Yes. As this is an agricultural research project special emphasis will be placed on small production, productivity and increased farm incomes. On farm research will be emphasized.

**b. Nutrition:** Describe extent to which assistance is used in coordination with efforts carried out under FAA Section 104 (Population and Health) to help improve nutrition of the people of developing countries through encouragement of increased production of crops with greater nutritional value; improvement of planning, research, and education with respect to nutrition, particularly with reference to improvement and expanded use of indigenously produced foodstuffs; and the undertaking of pilot or demonstration programs explicitly addressing the problem of malnutrition of poor and vulnerable people.

N/A.

**c. Food security:** Describe extent to which activity increases national food security by improving food policies and management and by strengthening national food reserves, with particular concern for the needs of the poor, through measures encouraging food reserves, expanding available storage facilities, reducing post harvest food losses, and improving food distribution.

The project will promote production of basic food crops as well as high value non-traditional export crops.

**21. Population and Health (FAA Secs. 104(b) and (c)):** If assistance is being made available for population or health activities, describe extent to which activity emphasizes low-cost, integrated delivery systems for health, nutrition and family planning for the poorest people, with particular attention to the needs of mothers and young children, using paramedical and auxiliary medical personnel, clinics and health posts, commercial distribution systems, and other modes of community outreach.

N/A.

**22. Education and Human Resources Development** (FAA Sec. 105): If assistance is being made available for education, public administration, or human resource development, describe (a) extent to which activity strengthens nonformal education, makes formal education more relevant, especially for rural families and urban poor, and strengthens management capability of institutions enabling the poor, and strengthens management capability of institutions enabling the poor, and strengthens management capability of institutions enabling the poor to participate in development; and (b) extent to which assistance provides advanced education and training of people of developing countries in such disciplines as are required for planning and implementation of public and private development activities.

N/A.

**23. Energy, Private Voluntary Organizations, and Selected Development Activities** (FAA Sec. 106): If assistance is being made available for energy, private voluntary organizations, and selected development problems, describe extent to which activity is:

N/A.

a. concerned with data collection and analysis, the training of skilled personnel, research on and development of suitable energy sources, and pilot projects to test new methods of energy production; and facilitative of research on and development and use of small-scale, decentralized, renewable energy sources for rural areas, emphasizing development of energy resources which are environmentally acceptable and require minimum capital investment;

b. concerned with technical cooperation and development, especially with U.S. private and voluntary, or regional and international development, organizations;

c. research into, and evaluation of, economic development processes and techniques;

d. reconstruction after natural or manmade disaster and programs of disaster preparedness;

e. for special development problems, and to enable proper utilization of infrastructure and related projects funded with earlier U.S. assistance;

f. for urban development, especially small, labor-intensive enterprises, marketing systems for small producers, and financial or other institutions to help urban poor participate in economic and social development.

C. CRITERIA APPLICABLE TO  
ECONOMIC SUPPORT FUNDS ONLY

N/A

**1. Economic and Political Stability** (FAA Sec. 531(a)): Will this assistance promote economic and political stability? To the maximum extent feasible, is this assistance consistent with the policy directions, purposes, and programs of Part I of the FAA?

**2. Military Purposes** (FAA Sec. 531(e)): Will this assistance be used for military or paramilitary purposes?

**3. Commodity Grants/Separate Accounts** (Faa Sec. 609): If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made?



**4. Generation and Use of Local Currencies** (FAA Sec. 531(d)): Will ESF funds made available for commodity import programs or other program assistance be used to generate local currencies? If so, will at least 50 percent of such local currencies be available to support activities consistent with the objectives of FAA sections 103 through 106?

**5. Cash Transfer Requirements** (FY 1991 Appropriations Act, Title II, under heading "Economic Support Fund," and Sec. 575(b)). If assistance is in the form of a cash transfer:

**a. Separate account:** Are all such cash payments to be maintained by the country in a separate account and not to be commingled with any other funds?

**b. Local currencies:** Will all local currencies that may be generated with funds provided as a cash transfer to such a country also be deposited in a special account, and has A.I.D. entered into an agreement with that government setting forth the amount of the local currencies to be generated, the terms and conditions under which they are to be used, and the responsibilities of A.I.D. and that government to monitor and account for deposits and disbursements?

**c. U.S. Government use of local currencies:** Will all such local currencies also be used in accordance with FAA Section 609, which requires such local currencies to be made available to the U.S. government as the U.S. determines necessary for the requirements of the U.S. Government, and which requires the remainder to be used for programs agreed to by the U.S. Government to carry out the purposes for which

new funds authorized by the FAA  
would themselves be available?

**d. Congressional notice:** Has  
Congress received prior  
notification providing in detail  
how the funds will be used,  
including the U.S. interests that  
will be served by the assistance,  
and, as appropriate, the economic  
policy reforms that will be  
promoted by the cash transfer  
assistance?